

THE
DISEASES
OF THE
BONES,

OF
M. DU VERNEY, M. D.

Antient Professor of ANATOMY and
SURGERY at the King's Garden,

AND

Member of the ROYAL ACADEMY OF
SCIENCES at PARIS.

TRANSLATED BY
SAMUEL INGHAM, Surgeon.

LONDON:
Printed for THO. OSBORNE, in *Gray's-Inn, Holborne,*
MDCC LXII.

D I S T I N G U I S H E D

B O R N

R. R. BERNARD, M.D.

THE STUDY OF THE DISEASES OF THE BONES
SURGERY OF THE BONES
cannot be too strongly recommended to

young gentlemen we consider that
a great part of the study of the
luxations is given in many places by the
most liberal people commonly called Bone
Setters. Who have not the least pretension to
Knowledge in the Elements of an Art so essen-
tial to be well understood for the Public Good.
Indeed, no Country can boast of having brought
Surgery in general to so high a Degree of Perfection
as this. In this I am sure, but it must be
granted, that no complete Treatise has been wrote
in English on this most interesting branch of Surgery.



At the Request of some worthy Practitioners
my Friends, I was induced to translate this part of
the celebrated MEDECINE DE VETTERAIRE, which
was

P R E F A C E.

are is universally admired by the most famous
Surgeons in Europe; that the Gentlemen of
the Profession have not had an Oppor-
tunity of being instructed in the French Language,
and that some Advantage therefrom

My Endeavours have been to adhere closely
to the Original, that I might do strict Justice to

P R E F A C E.

and that some Advantage therefrom

THE Study of the Diseases of the Bones cannot be too strongly recommended to young Surgeons, when we consider, that a great Part of this Subject, viz. Fractures and Luxations, is practised in Country Places by the most illiterate People, commonly called Bone Setters, who have not the least Pretension to Knowledge in the Elements of an Art, so essential to be well understood for the Public Good. Indeed, no Country can boast of having brought Surgery in general to so high a Degree of Perfection in a few years, as Britain; yet it must be granted, that no compleat Treatise has been wrote in English on this most useful Branch of Surgery.

At the Request of some worthy Practitioners, my Friends, I was induced to translate this Part of the celebrated Mons. Du Verney's Works, which

are so universally admired by the most famous Surgeons in Europe; that those Gentlemen of the Profession, who have not had an Opportunity of being instructed in the French Language, might reap some Advantage therefrom.

My Endeavours have been to adhere closely to the Original, that I might do strict Justice to the Merit of the Author; if I am censured for being too prolix, I hope the Goodness of my Intentions will plead some Excuse.

CONTENTS

A General View of the Diseases of the Bones page 1
 Division of this Treatise *ibid.*

BOOK I.

Of Fractures

CHAP. I. Of Fractures in general	—	<i>ibid.</i>
ART. I. Of the Differences of Fractures	—	<i>ibid.</i>
ART. II. Of the Causes of Fractures,	—	6
ART. III. Of the Signs of Fractures,	—	8
ART. IV. Of the Accidents of Fractures,	—	9
ART. V. Of the Prognostic of Fractures in general, and particularly simple Fractures,	—	14
ART. VI. Of the Prognostic of compound Fractures,	—	15
ART. VII. Of topical Remedies proper to Fractures,	—	17
ART. VIII. Of Bandages proper to Fractures,	—	19
CHAP. II. Of simple Fractures,	—	22
CHAP. III. Of compound Fractures,	—	26
The operative Part of the compound Fracture,	—	<i>ibid.</i>
CHAP. IV. Of the longitudinal Fracture of the large Bones, called <i>Fissure</i> ,	—	61
CHAP.		

CHAP. V. Of the Fracture of the Bones of the Head,	68
ART. I. Of the Fracture of the Bones of the Nose,	ibid.
ART. II. Of the Fracture of the Zygomatic Process	72
ART. III. Of the Fracture of the lower Jaw,	74
CHAP. VI. Of the Fractures of the Trunk,	78
ART. I. Of the Fracture of the Clavicle,	ibid.
Bandage of the oblique Fracture,	84
Bandage of the transverse Fracture	85
ART. II. Of the Fracture of the Scapula	87
ART. III. Of the Fracture of the Sternum,	91
ART. IV. Of the Fracture of the Vertebrae,	94
ART. V. Of the Wounds of the Spinal Canal, i. e. the Vertebrae,	97
ART. VI. Of the Fracture of the Ribs,	99
ART. VII. Of the Fracture of the Bones, that compose the Pelvis,	110
CHAP. VII. Of the Fracture of the superior Extremities,	114
ART. I. Of the Fracture of the Arm,	ibid.
ART. II. Of the Fracture of the Fore-Arm,	121
ART. III. Of the Fracture of the Fingers,	129
CHAP. VIII. Of the Fracture of the inferior Extremities	131
ART. I. Of the simple Fracture of the Thigh,	ibid.
ART. II. Of the Fracture of the Neck of the Femur, which has been mistaken for a Separation of the Epiphysis,	139
ART. III. Of the Fracture of the Rotula,	147
ART. IV. Of the Fractures of the Leg,	156
CHAP. III. Of the Formation of the Callus,	165

B O O K II.

Of Luxations,	177
CHAP. I. Of Luxations in general,	ibid.
CHAP. II. Of the Contortion of the Head of the Bones, and that of the Muscles,	197
CHAP. III. Of Club Feet,	198
CHAP. IV. Of the Relaxation of the Joints,	199
CHAP. V. Of the Sprain, and Separation of the Bones,	201
ART. I. Of the Sprain,	
ART. II. Of the Diastasis, or Separation of the Bones,	204
CHAP. VI. Of Luxations in particular,	206

CONTENTS.

vii

ART. I. Of Luxations, that happen to the Head and Trunk,	ibid.
I. Of the Luxation of the lower Jaw,	ibid.
II. Of the Luxation of the Vertebrae, of the Concussion of the Spine, of the Crookedness of it's Canal, and of the Formation of Bumps,	216
I. Of the Luxation of the Spine,	220
II. Of the Concussion of the Spine.	220
III. Of the Crookedness of the Spine, and of the Formation of Bumps,	221
ART. II. Of the Luxation of the superior Extremities,	227
I. Of the Luxation of the Arm,	ibid.
Signs of the Luxation of the Arm, which is fallen under the Axilla,	230
Prognostic,	231
Reduction, and Cure,	233
The first Method of reducing the Head of the Humerus,	ibid.
The second Method of reducing the Humerus,	234
The third Method of reducing the Humerus,	ibid.
The fourth Method of reducing the Humerus,	235
The fifth Method of reducing the Humerus,	236
The sixth Method of reducing the Humerus,	ib.
The seventh Method of reducing the Humerus,	ibid.
The Apparatus,	239
II. Of the Luxation of the Fore-Arm,	240
I. Of the Luxation of the Elbow,	ibid.
II. Of the Luxation of the Radius,	243
III. Of the Luxation of the Wrist,	250
IV. Of the Luxation of the Fingers in general, and the Thumb in particular,	255
I. Of the Luxation of the Fingers,	ibid.
II. Of the Luxation of the Thumb,	158
ART. III. Of the Luxation of the inferior Extremities,	161
I. Of the Luxations of the Thigh,	ibid.
II. Of the Luxation of the Knee,	275
III. Of the Luxation of the Foot,	279

BOOK

BOOK III.

<i>Of the Diseases of the Substance of the Bones, and their Articulation,</i>	286
CHAP. I. <i>Of the Softness and Crookedness of the Bones, or of the Rickets,</i>	ibid.
CHAP. II. <i>Of the Softness of the Bones, and what renders them brittle,</i>	307
CHAP. III. <i>Of the Ankylosis,</i>	311
CHAP. IV. <i>Of the Caries,</i>	331
CHAP. V. <i>Of Exostoses,</i>	356

THE

A
T R E A T I S E
O F T H E
D I S E A S E S of the B O N E S.

A general View of the DISEASES of the BONES.

The Division of this Treatise.

TH E whole Body of an Animal is only a Compages of a certain Number of solid and soft Parts, composed of different Vessels, in which should flow and circulate the many contained Fluids; from whence it is easy to judge that Health, and Life, consist in a Symmetry, and determined Proportion of solid and soft Parts, of Vessels and Fluids; wherefore these same Fluids, mixed differently, and circulating more slowly and quickly in these Vessels, disposed in different Manners, produce all the Actions of the Animal.

If any Disorder attacks those Vessels, or Fluids, many Changes must ensue, which are the Causes of all Diseases. To give a more intelligible Notion of what I have to say of those of the Bones, which are my only Object, I think I cannot so well explain their Changes, as by comparing them to those that happen to the soft Parts.

The Blood, Lymph, and nutritive Juice of the Parts, do not always flow regularly in their Vessels. Their Circulation is frequently interrupted, either because they inspissate, congeal, and coagulate by some Acid; or by the Confusion and Disorder of those Canals; or because they escape out of their ordinary Course by the Action of some Corrosive, or other Cause that pierces or lacerates them; Then, their Motion be-

ing impeded, they congeal, as they are no longer capable of being propelled by any elastic Power of the animal.

This Irregularity is the general Cause of all Inflammations, Tumors, and Abscesses of the soft and hard Parts.

It is called an Erysipelas in the Skin, a Phlegm in the Membrana adiposa, and an Inflammation in the Periosteum. A scirrhous Tumor in the soft Parts is called an Exostosis in the Bones. The spongy Texture of the Epiphyses, and the Marrow, are subject to Abscesses like the soft Parts. It is to be observed what is called an Epiphysis, is no longer so in the Adult, as it then makes a Continuity with the Body of the Bone.

When the Blood, or nutritive Juices, by their Acrimony erode and lacerate the Substance of the Parts, a Change is produced which is called Ulcer in the Flesh, and Caries in the Bones; and, as the Caries cannot be cured without Exfoliation, no more than the Ulcer without Suppuration, the Exfoliation may be said to be to the Bone, what the Suppuration is to the Flesh.

When the Substance of the Parts is only bruised by some Accident, either a Blow, Fall, &c. it is called a Contusion, as well in the soft as in the hard Parts.

When the Texture of the Parts is hurt by any foreign Cause, that punctures, pierces, or cuts, the Injury received thereby is commonly called a Wound, both in the soft and hard Parts; and, when Blows are so violent as to break their Texture, it is called a Fracture in the Bones, and a Laceration in the Flesh.

When the Lymph, and nutritive Juices transpire, or escape by the Inflammation, or Erosion of the Parts, they then, like Glue, bind and unite Parts naturally separated. This is seen in the Adhesion of the Pleura with the Lungs; the Liver and Spleen with the Diaphragm; and it is called a preternatural Union in the soft Parts, and an Ankylosis in the Bones. It may also be owing to the Hardening of the Synovia emitted between the Joints.

When the nutritive Juices become too oily, they so relax, and soften the Texture of the Parts, as to make them lose their natural Consistence, and produce that Disease called Softness; which still shows itself more in the Bones, and which is almost always accompanied with their Curvature.

When the Intestines are compressed by the violent Contractions of the Diaphragm, and a great Part of the Abdominal Muscles, they overcome the Resistance of the inferior Portion of the transverse and internal oblique Muscles; which occasions the Ring of the external oblique to dilate: Whereby they get a Passage into the Groin, and Scrotum. This Displacement, called

Curvature

Hernia

called an Hernia, is quite similar to that which happens to the Bones, when they are forced by any violent Shock to quit their natural Situation, and pass into the neighbouring Parts. Therefore the Luxation is in Respect to the Bones, what the Hernia is to the Intestines.

The Bones are subject, as has been said, to the same Diseases as the soft Parts; but, in order to give a just Detail of them, I will reduce them to three principal Classes: Some attack their Substances, others change their Situation, and others their Figure.

Those that attack their Substance are of two Kinds; the one is owing to a vitiated State of the nutritive Juices, and the other to violent Impressions of external Causes.

The first are Caries, Exostoses, Softness, and Brittleness of the Bones.

The second are their Wounds, Contusions, and Fractures.

The Diseases that change the natural Situation of the Bones are also of two Kinds: The Maladies of the first Sort are owing to a vitiated state of the Fluids, and those of the other Kind to the Impressions of external Causes.

The first are yet again of two Kinds: The one is produced by the Depravation of the Synovia of the Joints, the other by that of the nutritive Juices of the Bone.

The Diseases of the first Species are all Ankyloses, Nodes, and all Tumors that attack the Joints, such as those that happen to the Gouty, and to those affected with old Rheumatisms, and all those that frequently accompany the long Treatment of Luxations, Fractures, Aneurisms, &c.

Those of the second Kind are all Ankyloses proceeding from the Extravasation of the nutritive Juices occasioned by the Fracture of the Pieces composing the Joints, or Caries that are near them.

The Diseases that change the natural Situation of the Bones, and that are owing to external Causes, are Luxations, Sprains, Separations and Fractures.

Amongst the Diseases that change the Figure of the Bones, some depend upon a vitiated State of the nutritive Juices: Such is the Curvature of rickety Bones, &c. which is always preceded by their Softness; others upon the unequal Compression of certain Pieces of Bone, which become as so many little Wedges, that push, and displace the adjoining Pieces. This is evident in the Curvature of the Spine, and Formation of Bumps. Others are owing to an unequal Contraction of the Muscles, as is remarked in those whose Feet are turned outwards or inwards. Finally others proceed from Fractures badly reduced.

This Treatise shall be divided into three Books.

The first shall treat of what concerns Fractures; the second shall have Luxations for its Subject, and the third, the Diseases of the Substance of the Bones.

In order to a perfect Understanding, it is necessary to know by Anatomy, not only their internal and external Structure, but also to be informed of their Arrangement. I do not suppose my Readers ignorant of this, as they may be informed of it by a Variety of Authors, and they will find it in my Anatomy. If any Circumstances occur, that may oblige me to a Repetition, it shall be done with all possible Brevity; and that only where the Occasion indispensibly requires it.

BOOK THE FIRST.

Of FRACTURES.

CHAP. I.

Of Fractures in general.

ARTICLE I.

Of the Differences of Fractures.

THE Differences of Fractures are drawn either from the Manner in which the Bone is fractured, or from their Symptoms.

If they are considered as to the Manner how the Bone is broken, they are of many Kinds; for the Bone may be fractured transversely, or obliquely, totally or partially.

If the whole Substance of the Bone is entirely broken, it is called a compleat Fracture, and incompleat when partially, as is frequently remarked in the Bones of the rickety, in the Cubitus and Radius of Children, in the Ribs, and Bones of the Cranium. In Parts composed of two Bones, if both are broken, it is called a compleat Fracture, and incompleat if only one.

Transverse, and oblique Fractures, generally affect the whole Thickness of the Bone. Both happen with, or without Splinters, and of these Splinters some are entirely separated from the Body of the Bone, and others still hold by it.

A transverse Fracture is either with or without a Displacement; The first Case is frequently enough seen in the Ribs, and

DISEASES OF THE BONES. 5

and sometimes in Fractures of the Extremities. The oblique Fracture is always displaced. Fractures whose Ends are angular and jagged, are less subject to be displaced.

Transverse Fractures are displaced in two Ways, either according to the Length, or Thickness of the Limb. The Displacing lengthwise does also happen two Ways, either when the two broken Pieces have slid upon each other, or when one of them is at a great Distance from the other, which is very frequently seen in a transverse Fracture of the Olecranon, or Rotula.

In Limbs with only one Bone, as the Thigh, the Displacement breadthwise happens, when one of the fractured Ends has been forced towards the Circumference of the Limb, which it approaches more forwards, or backwards; and in Parts with two Bones, as the Leg, this Sort of Displacing happens when one of the Pieces remains in its Situation, whilst the other approaches it; in the oblique the Displacement is principally lengthwise.

There are three principal Causes of a Displacing, the Direction of the Blow, the Action of the Muscles, and the Weight both of the Part and Body.

The Direction of the Blow causes a Displacement; For Instance, if it is given upon the Arm, the inferior Part being most moveable, will be carried in a contrary Direction to that of the Blow.

Secondly. The Muscles contribute in two Ways to displace the fractured Pieces, either by their involuntary Contraction, which is of two Sorts; the one natural, viz. their proper Elasticity, and the other preternatural and convulsive: Or by their involuntary Contraction, occasioned by the Patient's Motion after the Blow, or Fall.

This Displacement may likewise proceed from the bad Treatment of an ignorant Bone-Setter, an unskilful Surgeon, or Assistants.

Fractures the most subject to be displaced, as well by the natural Spring of the Muscles, as by the Weight of the Part, or Body; are, first, that of the Femur near the Trochanters, where the inferior Part is drawn upwards and outwards by the Gluteal Muscles, and forced towards the same Place, by the Weight of the Body, when we rest upon the Leg of the fractured Thigh.

Secondly. That of the Clavicle, when the Part that is united to the Acromion, is drawn downwards, as well by the Deltoid Muscle, as by the Weight of the Part.

Thirdly. That of the Radius, where the inferior Extremity

is drawn inwards by the Contraction of the Pronator Quadratus.

Fourthly. That of the Jaw, where the Chin is drawn downwards as well by the Digastric, and other Muscles attached to its Symphysis, as by its own Weight.

In a Fracture of the Olecranon, and Rotula, the Extensor Muscles of the Leg, or Cubitus, draw the superior Part of the Fracture upwards, as well by their Elasticity, as for Want of a firm Support.

Fractures are less liable to be displaced in Children than in Adults; First, because their Bones being very tender, never break smooth; therefore their Surfaces are best with many Points, which are intangled in one another: Secondly, because their Limbs are never exposed to such violent Shocks, as well upon Account of their natural Weakness, as of that of the Muscles. In Parts where there are two Bones, the Displacement cannot happen in any other Way, than according to the Thickness of the Limb.

The Displacing of fractured Pieces by the Action and Force of the Muscles, vary according to their different Degrees of Force, and Directions; so important is this Knowledge, that from it the different Bandages, and Machines proper for the Treatment of Fractures are partly taken. One Example will suffice. In the Fracture of the Clavicle, the Piece joined to the Acromion is drawn downwards by the Deltoid Muscle, and Weight of the Arm, and this Piece may easily slide under the other, because the Arm being no longer supported by the Clavicle, is thrown upon the fore Part of the Thorax, even independently on the Inclination we have to carry it there. In such a Case, this Fracture may be considered as oblique; To remedy it, and to secure the reduced Parts properly, we are to keep the Arm in the same Situation, as when the Conformation was made, viz. to force the Shoulders backwards, as will be explained in speaking of that Fracture.

ARTICLE II.

Of the Causes of Fractures.

Almost all the Causes of Fractures are external, as Blows, Falls: I have said, almost, because the Rotula has been broken by a violent Contraction of the Extensor Muscles of the Leg, without either Blow or Fall. It is necessary to remark, that it is not always a Blow, or Fall, that occasions a Fracture; and that Resistance produces the same Effect. For Example, the Leg being caught betwixt two Stones, if the Person

Person falls, or is pursued, the Resistance of the Stone, occasions the Fracture. Fractures caused, or kept in that State by a Venereal, Scorbutic, scrofulous Virus, or by Fire Arms, ought to be classed with the compound.

As to the Separation of Bones, whose Fractures are transverse, and oblique, the Causes are either internal or external. Among the Internal, which are less frequent, the Caries is the most common; and it is owing, either to a general Depravation of the Fluids, as in the Lues venerea, and Scurvy, or to some old Fistula in the Neighbourhood of a Bone. The other Causes are the Defect of the nutritive Juice, and Marrow, or a Softness distributed unequally in the Bone; in short every Thing that may render the Bone brittle. The external Causes are Blows, Falls, and Gun-Shot Wounds.

The Signs of these Fractures are Pain, and a Difficulty of using the Part; but these Signs are equivocal, for they frequently appear without any Fracture; whether they proceed from a Fissure, Contusion, or both, or from some Collection of Matter betwixt the Bone and Periosteum.

A Caries commonly begins at the interior Part of the Bone. It is almost without Pain, because it has not yet arrived at the Periosteum. The Bone is eroded gradually in such a Manner, that there only remains a very thin Plate that is sound; for which Reason, it is fractured in that Place by the least Force, ere it is foreseen by those to whom it happens, as has been observed in some Femurs, whose superior Parts were carious, the Caries having intirely eaten away one Side of the Bone; in this Case the Patient turning himself in Bed, the Fracture instantly happens.

Paré relates in his Treatise of Fractures, that Mr. Marchand Advocate to the Chatelet of Paris, having a Fluxion upon the Knee Joint, that tormented him for eight Months, and after he had tried all Sorts of Medicines, turning himself one Day in Bed, he fractured the Femur near the Knee. He died of it a few Days after. The Joint being laid bare: the Femur was found carious, and separated from its inferior Part, which was also carious, and worm eaten.

The Softness of Bones may be added to the Number of the internal Causes of Fractures, as is evident in the Rickets, which are so subject to Fractures, especially the Bones of the inferior Extremities. Lastly, the violent Contractions of the Muscles may be ranked, as has been mentioned in speaking of the Rotula, which has been broken by merely endeavouring to avoid a false Step; but that this may happen, it is necessary not only that the Effort be violent, but also very sudden.

ARTICLE III.

Of the Signs of Fractures.

THE most certain Signs of Fractures are an Unevenness in the Figure, Size, and Surface of the Part; for Instance, when a straight Part becomes crooked, awry, or shorter than it was; but that does not always happen; and even if it should be shorter, it is necessary to examine attentively, if that does not proceed from some Luxation, or bad Conformation. Indeed People have been seen without a Cavity in their right Os Innominatum; therefore the Thigh of that Side was longer than the other.

A Fracture is still more particularly known, when it is felt by the Fingers; or when the Part can be bent with the Hand, or Splinters are perceived, and a Noise called a Crepitation is heard, from handling, and turning the Parts in different Directions, or when the Pieces are displaced, especially according to the Length of the Limb.

Lastly, a Fracture is easily discovered in thin People, particularly when it is without Swelling, and Contusion.

When the Part is composed of two Bones, and one is whole, the Patient may still perform the Motions depending upon the sound Bone. For Example, in a Fracture of the Leg, if the Fibula is broken, whether by an external Cause, which happens most commonly, or an internal one, the Patient can walk, and not perceive it till some Time after: If it is the fore Arm, and the Radius is fractured, he can nevertheless bend and extend the Elbow, but he cannot perform Pronation, and Supination, except in a very irregular Manner, and with great Pain, by supporting the Part with the other Hand: If the Cubitus is broken, Flexion cannot be performed. In like Manner, the Leg cannot be rested upon, when the Tibia is fractured, because the Fibula is intirely out of the Center of Gravity, and too weak to support the Weight of the Body. The Foot cannot even be bent, nor extended regularly, and if the Patient would use that Leg, he runs the Risk of rendering the Fracture much more dangerous than it was, viz. of making it compleat from incompleat, and compound from simple, which it was. If the Fibula, as abovementioned, is only fractured, he may support himself upon the Tibia, but it is always with Difficulty, because of the Dragging of the Muscles attached to the Fibula, and interosseous Ligament.

Although this Principle be true, it must nevertheless be allowed, that the Difficulty of moving a Part, as well as the Pain, may

may be equivocal Signs of a Fracture, because both may be occasioned by a violent Contusion. Hence there is so much Difficulty in discovering whether there be a Fracture, especially when the Parts have kept their Level.

This Difficulty proceeds from the vast Swelling of the Part, and great Sensibility of the Patient, who will not suffer himself to be touched. In such a Case, the Division of the Texture of the Bone ought to be less attended to, than the Disorder of the soft Parts, which requires the whole Attention of the Surgeon, especially if the Contusion is near the Joints, as the Elbow, Wrist, Knee, Malleoli, great Trochanter: And when this last Accident happens to fat, or very old People, they are ever after unable to move the Part.

ARTICLE IV.

Of the Accidents of Fractures.

FRactures are divided into simple and compound. A Fracture is called simple, when no other Accident attends it than those that are common to Fractures. In short when the Bone is simply broken, and only requires a simple Reunion for it's Cure.

That is called compound, which is accompanied with Diseases, and Accidents, each furnishing a particular Indication, that cannot be answered, either by the same Remedy, or Treatment; as when there is a Wound, great Contusion, extraneous Bodies, Fever, Convulsions, and such like Accidents; which require different Remedies, and Operations, for their Cure.

It frequently happens that a Fracture simple at its Beginning, becomes compound by the succeeding Accidents.

Startings are generally inseparable from Fractures. They are convulsive Motions, which happen at all Times to a fractured Part. Paré says he felt those Startings when he had his Leg broken. The Salts of the extravasated Juices beginning to ferment, may irritate the nervous Fibres, or the Points of some Splinters displaced by the Patient's Motion whilst asleep may prick them, or one of the Ends of the Fracture may be slightly displaced, as it may happen in the Case of a simple one. Then the Spirits stored up in the Brain during Sleep, finding their Passages streightened, are disposed to flow briskly, and by Intervals, into the Muscles of the wounded Parts, and shake them by convulsive and irregular Motions, which are different according to the different Shocks.

The Splinters, or Fragments in compound Fractures, frequently occasion very troublesome Accidents to the broken Limb.

Limb. Those Pieces may hurt it, either upon account of their Number, their Distance from the fractured Place, their Points, or by Reason of the Periosteum that covers them.

It is easy to judge that, when the Splinters are very numerous, the Fracture ought to be considered as very complicated: First, in Respect to the Symptoms, that threaten it, for if there is so great a Disorder in the hard Parts, how much more in the soft. Secondly, in Respect to the Conformation, it being very difficult to reduce each well into its proper Place: Thirdly, relatively to the Cause that produced it; for Example, a Ball, a Wheel; for in this Case the Bone is in a Manner shivered to Pieces, and its whole Substance destroyed: Fourthly, in Respect to their Distance. It is good Practice to extract by a Counter-opening the Splinters that are at great Distance from the Fracture, or intangled in the Muscles; because they cannot be drawn out by the Wound, nor rejoined, without occasioning very violent Pains, lacerating and dragging the neighbouring Parts.

As to the Points of Splinters, which frequently prick the Tendons and Muscles, or open large Vessels, Accidents greatly to be dreaded, in order to remedy the Evil, the Points are to be cut, either with a Chisel, cutting Pincers, or some other proper Instrument, the Wound to be dilated, if found necessary.

When the Splinters are known to be entirely stript of the Periosteum, they ought to be considered as extraneous Bodies; and consequently as many must be extracted as possible, or else we wait till they fall by the Suppuration, viz. till an Abscess forms where the Splinter is lodged, and the Matter of that Abscess draws it along with it at the first Opening.

All Abscesses, which befall Fractures, ought not to be considered as terrible Accidents; for Nature frequently makes Use of them as a Means to calm the present Symptoms, and prevent those which there is Reason to fear. For Instance, if there is any considerable Tension in the wounded Part, the Swelling and Pain, generally cease after the Abscess is opened.

Frequently many Months, and even many Years after the confirmed Cure of a Fracture, an Inflammation appears in the fractured Place, or thereabouts, which produces a Suppuration: This Accident, which some might consider as fatal, is only occasioned by a Splinter, or a Portion of Bone, which is discharged by this Way.

It sometimes happens in compound Fractures, during the great Heats of Summer, that the Dressings are filled with Worms, which seems to be a mortal Sign; but if we reflect that

that the Dressings are not often changed in Fractures, and that the Patient exposes the wounded Part to the Air as much as he can, it will appear that the Flies or other Insects are allured thither, as much by the Putrifaction of the Liquors employed, as by the Juices that transpire from the Part. Now they deposite their Eggs in different Parts of the Dressings, which, hatching by the Heat and Fermentation of the Humours of the Wound, give Birth to those Maggots. To remedy this, Wormwood is very usefully employed, and we mix it with all the Liquors used for moistening the Bandage.

Fractures where the Bone is divided into many separate Pieces, are very dangerous, and difficult to be cured, especially in the great Heats of Summer.

Fractures where the Bone is shivered into many Pieces, that lacerate the Tendons and Nerves, or open large Vessels, and those where the Ends of the fractured Bones lacerate the Flesh, and come out at the Wound, as abovementioned, are so dangerous, as to require Amputation as the most sure Means, to prevent a Croud of insurmountable Accidents, which will destroy the Patient, after having to no Purpose suffered long and cruel Torments, and which occasion by this Delay a double Complication.

When we are obliged to saw off the Extremity of a Bone to reduce it, or raise up a Portion separated in its whole Thickness from the Body; it is to be feared that, after the Patient is well, the Part may be shorter; and if that happens to one of the Extremities, that he may not remain lame, great Care should be taken to keep the Leg extended by Ligatures fixed above and below. Notwithstanding all these Precautions, it is very difficult to prevent these Accidents, unless the Lymphatics furnish Juices necessary to repair this Loss.

In Fractures where the Bones are entirely shivered to Pieces, and in a Manner ground to Powder, it is necessary to have Recourse to Amputation; as also in those, where the Hemorrhage is so great, that it cannot be stopt, for Want of being able to lay hold of the Vessel.

Fractures beginning by the Putrifaction and Corruption of the Marrow, are accompanied with very bad Accidents. They are incurable; and though it is necessary to proceed to Amputation, it seldom succeeds.

Accidents proceeding from the Muscles are an Inflammation and painful Tension, often terminating in a Gangrene, without being accompanied with any Suppuration, which also renders the Fracture compound. There is no Suppuration in the Muscles, except when their Fibres are cut, or lacerated, their

their Juices extravasated, or when there is a Division in the soft Part. This Wound may be owing either to the Impression of the external Cause, which produced the Fracture, or to the Ends of the broken Bone that have pierced the Teguments.

If the Wound is simple, the Fracture may be dressed with a single headed Roller, but if it is accompanied with a considerable Contusion, a large Hemorrhage, if it penetrates to the Bone, or if there be any Loss of Substance; all these Accidents render the Fracture compound.

As to the hard Parts, the Accidents that render a Fracture compound, proceed either from the Fault of the Bone, the Place of the Fracture, the Manner in which the Fracture happened, or from extraneous Bodies.

In Respect to the Depravity of the Bone, when there is a Caries, Softness, Exostosis, and if these Diseases occasion the Fracture, they render it compound. As to the Caries, it is necessary to remark, that it must be more attended to than the Fracture.

In Respect to the Situation of Fractures, all those happening near the superior and inferior Extremities of the Thigh, Leg, Arm, &c. ought to be treated as compound, in Regard to the Bandage only; because they are very painful, the Tendons and Ligaments being concerned, and because they cannot be dressed without displacing the reduced Parts.

In Respect to the Species of the Fracture, an oblique ought to be considered as compound, for as the rolled Bandage cannot prevent the Pieces from sliding upon one another, it is necessary to have Recourse to the eighteen tailed Bandage.

Extraneous Bodies that make a Fracture compound, may proceed from the Cause which produced the Disorder, as a Bullet, Wad, a Piece of the Cloaths, &c. and those are of two Kinds; the one proceeds from the Fluids, and the other from the Bone itself: The First are coagulated Blood, &c. the Second all Splinters that are met with there, and which are more or less dangerous, according to their Number, Figure, and Situation.

Those, for Instance, that prick or pierce the large Tendons, Periosteum, or Marrow, are very dangerous, especially the last, for the oily Juices of the Marrow, extravasating, and mixing with the Lymph, which oozes from the Periosteum, furnish the Matter of an Abscess, which is accompanied with many Accidents. Those that are entirely separated and stript from their Periosteum, ought to be considered as extraneous Bodies, which should be quickly removed.

Every

Every simple Fracture, where the Pieces cannot be moved on Account of the violent Tension of the Muscles, which oppose it, ought to be considered, and treated, as one of the most considerable compound Fractures.

That which is not displaced, and whose Muscles are not fatigued by violent Contractions, ought to be treated as simple.

An oblique Fracture requires much more Care in the Application of the Dressings, because if it is not well bound with a proper Bandage, the Pieces are subject to slip upon one another, and the Part will be shorter; an Accident much to be feared in the Thigh and Clavicle: In the first, on Account of the Thickness of the Muscles; in the second on Account of the Motion of the Scapula, which cannot be secured.

The Accidents, that render Fractures compound, may be occasioned either by a general Viciousness of the Fluids, or by the Disorders of the Part itself.

The general vitiated State of the Fluids consists, either in a Cacochymy, or in a Blood infected with a scorbutic, pocky, or *scrofulous* Virus. Then the Juices, which ought to nourish the wounded Part, and form the Callus, being vitiated, the Part is threatened with many Accidents, which would render the Fracture very complicated, when it would not be so in itself, and the Surgeon must direct all his Care and Pains against the general Cause.

If there is a Plethora, it is necessary to diminish the Quantity of Blood by frequent Bleedings, and an exact Regimen. If the Subject is full of Humours, they are to be evacuated by proper Purges, and frequent Clysters. If the Blood is tainted with any venereal, or other Virus, &c. we are to have Recourse to specific Remedies: Lastly, the nutritive Juices must be rectified and restored to their bland and balsamic Quality.

The Disorders of a wounded Limb are occasioned either by the soft or hard Parts. The soft Parts, that may be concerned, are the Skin, Fat, and Muscles, and they are with or without Division.

There are three principal Accidents to be feared from the Skin, viz. an Itching, the Erysypelas, which may be *Cedematous*, or *Phlegmonous*, and Vefications. They are occasioned either by the Application of greasy emplastic, or astringent Remedies. All which, intercepting the Discharge made by the Miliary Glands of the Skin, produce the above-mentioned Accidents, which may also be owing to the Acrimony of the Lymph moistening the Glands of the Skin, or to a Contusion, or Compression of the Vessels, that compose the
Texture

Texture of the Skin, and which are naturally dry, stiff, and firm.

As those Accidents oblige the Surgeon to visit, and dress the wounded Part frequently, they render the Fracture compound. To prevent which, nothing should be used in dressing, but the eighteen-tailed Bandage.

The Accidents proceeding from the Fat are the Œdema, and Phlegmon, which form under the Skin, or in the Interstices of the Muscles.

In most Fractures the Fat is somewhat contused, whence the oily Juices extravasated among the Cells of the Fat, and mixed with the Lymph, and other effused Juices, become acrid, ferment, and furnish the Matter of a Suppuration more or less copious, according to the different Degrees of Contusion, which renders the Fracture compound.

ARTICLE V.

Of the Prognostic of Fractures in General, and particularly simple Fractures.

THE transverse Fracture, whose Pieces are exactly even, is the most simple, and easy to be cured. The fractured Parts need only be secured, Nature does the Rest.

Where the transverse Fracture is considerably displaced, and especially if according to the Length of the Limb, it is very dangerous, and difficult to be cured, on Account of the violent Extensions the Muscles must necessarily undergo, which are greatly shortened, and the Violence the Part has suffered by the Laceration of the Periosteum, and other Parts.

The transverse Fracture of large Bones sustaining a great Mass of Muscles, are more difficult to be cured than those of small Bones, whose Functions are of little Importance.

If in Parts with two Bones, as the fore Arm and Leg, one only is fractured transversely, the broken Pieces will be more easily reduced, and secured, than if both were fractured; because the whole one serves as a Support, and Splint to the other. If the Displacement is considerable, the Fracture is more dangerous than if it was moderate.

The longer the Reduction of Fractures is delayed, there is so much the more Difficulty in succeeding; for, besides that the Interval of the Fracture may be filled up with some foreign Matter, much greater Extensions must be made; which occasion very acute Pains.

When Fractures happen to a very young, healthy, tractable, and

and calm Subject, who feeds on good Aliments; is in a good Air, and when the Season is temperate, they are more happily, and sooner cured, than if the Person is very old, infirm, of a bad Habit of Body, is recovering from a Disease, untractable, lives upon bad Nourishment, who is agitated with Passions, and in a bad Air, or when the Heat is excessive.

Fractures from an external Cause only, and happening to a Person whose Blood is not vitiated; are less dangerous than those occasioned, or kept up, by a latent venereal, scorbutic, or other Virus.

The most dangerous Fractures are those in the Neighbourhood of the Arteries; those made by Gun-Shot; those where the Bone is shivered into many Pieces, which prick and lacerate the Periosteum, the Membrane of the Marrow, the Nerves, Tendons, and which open very large Vessels, and those where the Extremities of the broken Bones lacerate the Flesh, and come out through the Wound they themselves have made.

It is said that Recourse ought to be had to Amputation in the Fracture of the Joints; Nevertheless Instances are daily seen, of their being happily cured; but those Wounds require the whole Attention of the most skilful Surgeon.

The Joints are surrounded with nervous and tendinous Parts, which must be kept from the Air, and from humid, and putrefying Remedies, which intirely destroy their Tone, which is already but too weak. It is necessary to strengthen it, and restore the Heat by Balsams quickened with Sp. Vin. and to forbear too frequent Dressings. In these Kind of Fractures, an Ankylosis is almost always the Consequence: Therefore the Surgeon ought to make his Prognostic early, informing the Assistants that the Patient will be a Cripple; because the Matter proper to form the Callus, being extravasated betwixt the Pieces of the Joint, cements them: Consequently this Organ will have no more Play.

The Patient would certainly die in Fractures where a large Artery is opened; and the Blood could not be stopt, either by the Ligature, Compression, or liquid and solid Caustics, and in those where the Bones are intirely shivered to Pieces, and as it were ground, if Amputation was not quickly recurred to.

ARTICLE VI.

Of the Prognostic of compound Fractures.

IN Respect to a Fracture, three Things render it compound, it's Situation, Figure, and Pieces.

Fractures either towards the superior or inferior Extremities of

of a Limb are very dangerous, because they are always very painful, as they cannot happen but the Tendons, Aponeuroses, Ligaments, and all the different Orders of the Vessels must be concerned. They are likewise very difficult to handle, bind up, and lastly to treat, without displacing the broken Pieces. Another Accident still happens, which is, that the tendinous Parts are continually irritated; consequently they redouble their Oscillations, and Strokes, which are communicated to the neighbouring Parts, and Membranes of the Brain. The Force upon the Solids occasions the Liquors moistening them to be so compressed, that their Course is thereby interrupted, and in a Manner stopped. From thence it happens that the Ligaments, and Tendons choak up, swell, and distend with so much Violence, that their Fibres thereby suffer continual Divulsions. From whence proceed Anxieties, Watchings, Fevers, Deliriums, convulsive Motions, Symptoms that are always inseparable from great Pain, and which soon putrefy, and gangrene the fractured Part.

Although these Accidents render the Cure of those Fractures very troublesome, some are nevertheless very happily cured, but that depends upon the Patient's good or bad Habit of Body, and requires all the Attention of the Surgeon. For the Business is to defend a Part abounding with Tendons, Aponeuroses, Nerves, Ligaments, and which has nothing to dread so much as the Admission of the Air.

When there is a Fracture with Wound, Tents, humid and putrefying Medicines entirely destroy their Elasticity, which is already but too weak. It thence follows that the best Indication is to soften, and relax these Fibres, to rectify the Fluids moistening them, and to endeavour to restore them to their natural Fluidity and Softness. From whence proceeds the Utility of Rice, Barley, and Oat Creams, Emulsions, Syrup of wild Poppies, Diacodium, mollifying Ptisans, and Laudanum.

As to the Figure of Fractures, all oblique, particularly those happening to the superior Part of the Thigh, are very difficult to be reduced, and still more so to be kept in their reduced State.

As to Fractures occasioned by violent Causes, and whose Pieces are divided into several Fragments, the Prognostic ought to be early drawn from the Accidents to be apprehended, and which the most attentive Surgeon cannot remedy, &c.

The Prognostic of Fractures, where large Vessels are opened, especially the Arteries, is always very bad, because Amputation is the only Remedy to save the Patient's Life. The same may be said of those where a large Portion of the broken Bone has
pierced

pierced the Muscles, and Teguments, and is stript of its Periosteum.

Every Fracture accompanied with great Contusion, and considerable Loss of Substance; is very difficult to treat, and most commonly the Limb must be taken off.

The Treatment of a Fracture occasioned by a Fall, or the Kick of a Horse, which shall instantly have caused a dry Gangrene, requires all the Attention of an experienced Surgeon to cure it.

No favourable Prognostic can be made for a Patient concerning Fractures from an internal Cause. They differ from one another according to the Depravity of the Fluids which produce them. Some are caused by a venereal, others by a scorbutic, and others by a scrofulous Virus. Some are even the Effect of a cancerous Virus. This is more common to Women than Men: The Fracture generally happens to the Arm, and a spongy Excrecence appears upon it's whole Circumference, whole Bulk is more or less evident to the Sight and Touch. These Fractures are always mortal. That occasioned by a Caries may be cured by Amputation, which is the only Remedy.

ARTICLE VII.

Of topical Remedies proper for Fractures.

TO remedy Startings, Sp. Lumbricor. or Aq. Regin. Hungar. is used externally at first. When the Disorder becomes obstinate, Recourse is had to Fomentations with Rad. Irid. vulg. Fol. Salvie, & Rosmarin. boiled in Wine, adding a little Castor towards the End of the Boiling. The Fomentations are repeated pro re natâ. A Liniment is also used with great Success, made of Ung. Nervin. & de Vigo. Sp. Lavend.—Rosmarin.—Lilii convallii, adding a little Ol. Hyascyam, &—Succin. to it.

To calm the too great Motion of the Spirits, Tinct. Castor. &—Succin may be used, or Pilul. Sapon. the present state of the Patient being always to be carefully attended to.

In Itchings we employ to Advantage, Sal. Saturn. Sp. Gallie. with a small Quantity of Camphor, the whole mixed with warm Water, especially for People whose Skin is fine and delicate. We likewise use Aq. Ranar. recent. with Sp. Vin. & Sal. Saturn. which is an excellent Remedy for all Cutaneous Diseases.

If there are Vesications, they must be opened and bathed with Aq. Calc. or Sp. Vin. camphor. sharpened with Sal. Ammoniac.

If little Ulcers are seen upon the Skin, or the Epidermis begins to excoriate, it may be bathed with Aq. Calc. quickened with a slight Solution of Lap. Medicament.

If the Itching is occasioned by Filth collected upon the Skin, it is sufficient to clean it with warm Wine; but if it is owing to the Acrimony of the cutaneous Lymph, Aq. alb. is employed, viz. on all these Occasions it is necessary to banish emplastick, or greasy Medicines, as also Repellents and Astringents. These Remedies obstruct the Pores of the Skin, and confine the Humour which ought to pass off by insensible Transpiration.

If the Skin is too much distended, and dry, then the Course of the Liquors is easily intercepted there; whence it is necessary to relax by anodyne Oils, or Cerates. Diapalma dissolved in Ol. Rosar. is very good, as also a whole Egg beat up with the same Oil; or Oil and Wine mixed with Water, or Emplast. à Sapon. reduced into a Cerate by Means of Anodyne Oils.

An Erysipelas is simple or compound, simple when the Skin alone is concerned; compound when both the Skin and adipous Membrane are affected. It is œdematous, when the Lymph extravasates in the Cells of the Membrana adiposa, and it is a Phlegmon, when the oily Juices and Lymph extravasate, and mix in the same Cells. Sac. Saturn. and Camphor are proper, as also a strong Decoction of Flor. Sambuc. adding a little Sp. Vin. and Sp. Nitr. dulc. The Patient must drink a Pisan made of Scabiosa, and Lingua Cervina. A Mixture of Mineral, diaphoretic in Aq. Ulmar. & scabiosa, and a little Confect. Hyacinth must be given him. Sp. Nitr. dulce is proper for an Erysipelas, where the Skin is red and shining. When the Skin is beset with many little red, or violet coloured Grains, it is an Herpes Miliaris. If the Skin is only swelled, Aq. Ranar. recent. with Sachar. Saturn. is serviceable.

Sp. Vin. camphor. Vin. Aromatic. are useful for an Œdema, and if they do not succeed, the lixivial Salts of aromatic Plants are employed.

If the Discharge in a great Suppuration becomes excessive, and the Patient is in any Danger, it is proper to diminish it. In such a Case we are to have Recourse to a Solution of Lap. Medicament. or Aq. Phagedenic.

ARTICLE VIII.

Of Bandages proper for Fractures.

AS to Bandages, it is known there are two Sorts; the one simple which is made of one Band, that has had nothing cut from it, nor any Thing added to it, and is divided according to its Variety of Circumvolutions into circular, oblique, spiral, and *rampant*. These are used for Fractures, which do not require frequent Dressings, and can be easily bound up without exposing the Extremities to any Displacement. Such are transverse Fractures of the middle of the Arm, fore Arm, Thigh, Leg, &c.

Some Practitioners make Use of two, sometimes of three Bands in these Fractures; but a Surgeon who is conversant in treating those Diseases, contents himself with one Band of a Length suitable to the Part, because it can inclose and keep on the Rest of the Dressings.

A compound Bandage is made of several Bands joined together, or of one alone cut into several Heads. The eighteen tailed one is the most common.

This Bandage is proper chiefly on three Occasions: First, when Fractures are attended with Wounds, Contusion, Extravasation, a Phlegmon, or when an Inflammation and Erysipelas supervene, because it is necessary to dress them frequently.

Secondly, when a Fracture is so situated that it cannot be bound up without the Hazard of displacing the Pieces. Such are, for Instance, Fractures of the Thigh, and Arm near the Joint.

Thirdly, when a Fracture is oblique; particularly if it is the Femur, although it be simple, and without any other Complication. I know this last Case is very much disputed amongst Practitioners. Some prefer the circular Bandage, because it embraces, and binds the fractured Parts more lightly without giving Way; and they say, that if the Pieces should happen to get out of their Places, they can discover it by comparing the Hips, Knees, and Heels, and remedy it by Ligatures without removing the Bandage.

Those, who contend for the eighteen tailed, pretend that as the Circumvolutions of the circular Bandage cannot be made without holding the Part in the Air, there is greater Danger of displacing the Pieces, and that the Assistants, who make the Extension, cannot keep them in their proper Order, but with great Difficulty, and the same Risk is run every Time it is proper, to apply and undo the Bandage; whereas by using the

eighteen tailed the Part is always supported during it's Application, and consequently the Pieces are less liable to be displaced, and that it may be tightened as much as is necessary to keep them reduced; and that there is Liberty of visiting the Fracture when requisite, without displacing it, or disordering any Thing, which may be done more easily and quickly, than with the other Kind of Bandage.

If the eighteen tailed Bandage is used in an oblique Fracture of the Thigh, it is as much to have the Liberty of visiting the Fracture frequently without moving the Thigh at every Dressing, as to secure the Pieces. Wherefore many celebrated Practitioners prefer a rolled Bandage, when this Fracture is towards the Middle of the Thigh, because the circular Turns bind the two broken Ends more closely, and that by being several times multiplied, as they are in this Bandage, they must secure, confine, and hold in the Muscles of the Part, better. They still farther observe to us, that they have the same Means to obviate the Shortening of a Limb, by making Use of Ligatures, and that they can watch with the same Facility by comparing the Feet; lastly, that if the Pieces are displaced, and the inferior is got above it's Place, they can employ Extension.

It has been observed, that it was very difficult to secure the Pieces of an oblique Fracture, especially of the Thigh, on Account of the Thickness of the Muscles, and that the eighteen tailed Bandage ought to be preferred, because it better resists the Shortening of this Part. There remains but one Thing to be observed concerning the Choice of this Bandage. It is commonly used with sufficient Advantage, but Scultetus's is much more proper to bind the fractured Pieces closely.

A transverse Fracture is more easy to be treated; for after the Reduction, we have only to apply a rolled Bandage like to that of a simple Fracture of the Leg.

As for a compound Fracture, a Box may be made Use of, such as I am going to give a Description of.

The Box is composed of four Pieces, or Boards.

The first makes the Bottom, which serves as a Floor, two form the Sides, and the fourth closes the Opening at the Extremity of the three first.

The three Pieces are so fitted to that serving for the Floor, that they can be joined to it, and separated from it. The Bottom, or Floor, is the first Piece. It is covered with a little Mattress, which sustains the Leg. The lateral Parts are likewise quilted, and being brought near together, they support the Leg,

Leg, and hinder it from moving laterally. The Piece that closes the Extremity of the Box, and which ought also to be quilted, sustains the Sole of the Foot, which keeps it more or less bent, because it is so disposed, that it can be more or less extended.

To make Use of it, the Sides are let down, or removed, as also that which closes the Extremity. Those Plates are joined by Hinges, or by Hinges with a Bolt.

The Strings that are to tie the Junks, are laid upon the Mattress, upon them the eighteen tailed Bandage is placed; the thick Compress to absorb the putrid Matter, or in it's stead waxed Taffety; and the Rest of the Dressings, as longitudinal Compresses, Paste-Board Splints, &c. are placed.

The Method of placing these Materials is nearly the same as that which is used in a compound Fracture of the Thigh. The Sides of the Box well lined within, equally answer the Purpose of the Junks. The Sole is likewise omitted; the Plate that closes the Extremity of the Box, and which is also lined, serves in it's stead.

It is necessary to remark, that an oblique Fracture in the Middle of the Thigh, may be treated by a circular Bandage, it being firmer, if Care be taken to hold back the Body by the superior Ligature, and to draw the lower Piece downwards by the inferior Ligature. The Shortening may be easily watched by comparing the Feet, and Hips, and remedied by Extension.

Some pretend, that a Fracture of the Arm near the superior Joint ought to be treated with a rolled Bandage, because the eighteen tailed does not compress. The Reason of this is, that in the Thigh the Hip serves as a Support to the crucial Compresses, or Paste-Board; but there is nothing above the Joint of the Arm, which serves the same Use.

As to a Bandage proper for a Fracture of the Thigh near the inferior Joint, the lower Part, and Ham, must be well guarded with double Compresses, and bound with a rolled Bandage; Care being taken to ascend by circular Turns along the Thigh, and pass round the Hips, and descend by another Band along the Leg that is bound up, after which it is carried about the Sole of the Foot. These are the two Points of Support.

In Parts fractured transversely, the Bandages made Use of are the same as those above mentioned; nevertheless there are *Practitioners*, whose Genius is distinguished by the Singularities of their Imaginations.

As to such Species of Fractures, they may proceed from three Ways of striking. When the Blow has bore perpendicularly to the Axis of the Bone, and obliquely to the Plane touching the

the Place struck, if the whole Length of the Fibres are of equal Strength, the Fracture will be made perpendicular to the Axis, but if they are of unequal Force, and the Points of their greatest Weakness are in a sloping Plane, the Fracture will be in this Plane: On the contrary, if their greatest Weakness is diffused in their Length, the Bone will break in a Surface beset with many Points, which will be intangled in one another. If the Blow is oblique to the Axis, and perpendicular to the Touching-Plane, and the Fibres are of equal Strength throughout, the Fracture will be aslope, and if they are of unequal Force, it will come near the Slanting, and will be thick set with Points.

If the Blow was altogether oblique to the Axis and Plane, as it only acts upon the Plane, according to it's perpendicular Force, this Case will coincide with the second; from whence it is evident that all those Varieties of Fractures depend upon the Direction of the Blow, and the different Arrangement of the Points, where each Fibre is weakest, &c.

C H A P. II.

Of simple Fractures.

THE Cure of a simple Fracture consists in four Things; First, in reducing the broken Bones; Secondly, in securing them in their reduced State; Thirdly, in placing them in a good Situation; and, Fourthly, in preventing the Accidents. Nevertheless we are not obliged to answer all these Intentions in the Treatment of all sorts of simple Fractures; as those that are exactly even, require only to be kept so.

Before the Means necessary to be employed to answer these Indications are proposed, we will examine what is proper to be done before we operate.

First, we are to take Care not to mistake a Contusion for a Fracture; Secondly, to be assured where the Fracture is, and of it's Species; Thirdly, if there are two Bones in the injured Part, to examine if one, or both are fractured; Fourthly, to see whether the broken Pieces are displaced or not; Fifthly, to choose a proper Place to lay the Patient in: Lastly, to order a Bed to be made, which has all the Advantages proper for the Patient, and Operator.

It is easy to distinguish a Fracture from a Contusion, when the Pieces are displaced, especially according to the Length of the

the Limb; but when they are even, and a large Tumor is come on by the Extravasation of a Fluid, and particularly if it is very great, it is difficult to distinguish it. In such a Case, if the Fracture is in the Leg, after having placed the Patient properly, we content ourselves with the eighteen tailed Bandage, as much to prevent the Pieces from being exposed to a greater Separation, in Case there be a Fracture, as to have the Liberty of procuring the Transpiration of the extravagated Juices by proper Resolvents. Particular Care is to be taken to secure the Foot and prevent it's Motions, which might excite fresh Pains. It is easy to judge from what has been said, that this Bandage is only contentive.

When the Tumor is dispersed, we very carefully examine if there is a Fracture. To satisfy ourselves in which we handle the Part in different Directions; we observe if it does not bend; we order the superior Part to be held firm, and, moving the inferior in different Directions, we listen whether the Pieces do not make a Noise, which is called a Crepitation; we at the same Time touch the Limb where we suspect the Fracture: It is known that, to make this Noise, one Piece of the Fracture must be immoveable, whilst we move the other, or that both Pieces be moved in contrary Directions.

It is easy to know when the Tibia is fractured, by sliding the Thumb upon it's Crista, and along it's internal Surface; by this Means we perceive if there is any Splinter, or other Unevenness sufficient to shew that the Bone has suffered; but if it is the Fibula, especially when it is broken near the inferior Joint, it is difficult to discover it, as well by Reason of the enormous Size of the Swelling, formed almost at the Instant of the Fracture, as on Account of the Violence of the Pain. We endeavour nevertheless to come at the Certainty of it, by pressing upon the Malleolus externus, and placing the Fingers of the other Hand where the Fibula is at the greatest Distance from the Tibia, viz: towards the Middle, whereby the Part from within being pushed outwards, and the other inwards, we can discover the fractured Place as well by the Crepitation we hear, as by the Pain we excite by dragging the Muscles, and neighbouring Membranes.

If we cannot find out the Fracture, by Reason of the supervening Swelling, the injured Part ought to be treated as if there was none. Nevertheless as these Sorts of Contusions, and enormous Swellings, cannot be resolved in general 'till after the twentieth or twenty-fifth Day of the Disease, and as then the Callus is already very far advanced, it is a very melancholy Case.

In a Fracture, we are certain of, the Surgeon must examine if it is transverse, or oblique, even or uneven, with a Splinter, or separated Pieces; if it is in the Middle of the Limb, or towards the Extremities. All these Particulars furnish him with the curative Indications, which are different.

If there are two Bones in the Part, as in the Leg, we examine whether the Tibia, or Fibula is fractured. The Tibia is greatly exposed, because it is bare; and when it is broken, besides that the Motions of the Foot are no longer regular, we cannot support ourselves upon that Leg, the Fibula being too weak to sustain it. The contrary happens, if it is the Fibula; for we can notwithstanding walk with sufficient Facility. People have been seen, who have walked a League after the Fracture of the Fibula, without feeling much Pain.

Then we are to examine, whether the fractured Pieces are displaced or not. If they are not, it is only necessary to think of reuniting them; for we have no need of Extension.

If there is any Displacement, it is according to the Length of the Limb, and the Extension and Counter-extension must be stronger, or it happens according to it's Thickness; which Species of Fractures do not require so great an Extension as the first just mentioned; nevertheless some is necessary, because the Ends of a Fracture, being always beset with Points, if we force back the Pieces by the mere Conformation, we should break some of them, which being intangled in the Muscles, might produce some bad Abscess, and would be as so many extraneous Bodies, being separated from their whole Substance. Therefore, as soon as there is any Displacing, it is necessary to have Recourse to the first and second Operation.

If the Fibula alone is fractured, and the inferior Part has been forced inwards, it's Reduction is more difficult, because we cannot make an equal Extension, on Account of the Resistance of the Tibia.

In order to make this Extension, we apply a Ligature at the inferior Part, and by ordering the Foot to be bent inwards, we cause a Swipe to be made to the depressed Piece, and at the same Time endeavour to raise it by pushing and compressing the Sides both forwards and backwards. Experience teaches us, that in Fractures of the Fibula, the Pieces are always depressed towards the Tibia; which is the Effect of it's natural Curvature, the Elasticity of the interosseous Ligament, and the Arrangement of the Fibres of the Extensor communis Digitorum Pedis.

If unfortunately the Pieces should remain displaced, it's Treatment is more tedious, because the Extremities of the Fracture, being

being at a great Distance, leave a considerable Space between them, which must be filled up by the new Callus; therefore a much longer Time is requisite for it's Formation; and the Patient in the End cannot move that Part but with Difficulty, because the Muscles are displaced, or their Fibres are dragged by the large Bulk, or Irregularity of the Callus. Sometimes even the Fibres of the Muscles adhere to it, and their Tendons are inclosed,

The Patient must lay in a very open Place, the Air will be more temperate there, neither too hot, nor too cold.

When we have the Liberty of ordering a Bed to be made, it is to be composed of three Feet, with a Side large enough for the Convenience of the Assistants; for it is always necessary to procure a Space on the Side of the wounded Limb; and supposing the Bed is from five to six Feet, the Patient must always be so placed that, if the right Leg is fractured, he be on the right Side of the Bed.

The Bed must be provided with one of Straw, or Hair, and one or two Mattresses. Those of Hair are preferable to any others, especially in Summer.

A Cord is to be fixed to the Bed Testern, or Cieling of the Room, if the Testern is not strong enough, which must fall opposite to the Patient's Breast, and at its End a transverse Pin covered with Linen, to give him the Advantage of moving as he has Occasion. To increase this Conveniency, a Board is ordered to be firmly fixed to the Foot of the Bed, which serves as a Stay to a Leg placed against the sound Foot. It must be of a sufficient Length, and Thickness, and covered with a little Mattress. The Patient pushing the Sole of the sound Foot against it, raises himself with Facility, and more easily changes Situation according to his Necessities, and particularly when he feels himself sliding towards the Foot of the Bed. When he would stretch out this Leg, the Log is removed.

After the first Days, if the Fracture is transverse, we may fill up the Space betwixt the Sole, and the Board, so that the wounded Leg may be supported against it, when by the Weight of the Body, or the bad Make of the Bed, that Leg slides to the Foot.

All the Apparatus must be disposed as I am a going to show, but it is proper to remark that in some Cases the Surgeon is obliged to operate, before he prepares his Dressings, viz. when there is a large Hemorrhage, or when the Patient is tormented with very acute Pains, occasioned either by the Pieces of the Fracture sliding over each other, or by Splinters and Shivers

entirely separated, and intangled in the Muscles and Tendons. As the extraordinary Hemorrhage, and Splinters, as above described, render the Fracture compound, we will propose the Means of remedying them, when we treat of this Sort of Fractures. If the Violence of the Pain is occasioned by the Pieces having slid over each other, it is necessary to make the Reduction before the Dressings be prepared.

What I am now going to say will serve to enable those Ignorant in the operative Part to remedy Fractures.

There must be four Assistants, one is to embrace the superior Part of the Fracture, which must be immoveable; another the inferior, which alone is to be removed from the Place of it's Lodgment, and he ought to be the strongest and most expert; the third is to give the Surgeon each Particular of the Dressings; the fourth must hold the Light, in Case it be wanted.

The Liquors we wet the first Compress in, serve only to remedy the Disorder of the Teguments; therefore, after having taken Care to shave the Part, if hairy, when there is a Contusion, we usefully employ Oil and Wine, or Oil and Brandy mixed together, or a whole Egg mixed with Ol. Rosar. & Sp. Vin. avoiding particularly the pernicious Practice of Country-Surgeons, who, after having mixed Bol. & Terr. sigillat. and other like Astringents with the White of an Egg, spread the whole upon a Pledget, with which they bind up the fractured Part. Now this Mixture makes a Sort of Mastic, which so obstructs the Pores, and binds the Part so strictly, that it either mortifies, or is so disposed in a few Days. Emplast. à Cerus, cum Camphor. is preferable in Case of Necessity.

All the Liquors that ought to be employed in this Case should be either spirituous, or mucilaginous, and anodyne; our chief Intention being to render the Perspiration of the wounded Part free and easy, to resolve the Juices that may be infiltrated in the Teguments, to preserve the Skin and Muscles in their natural Suppleness, and facilitate thereby the Course of the Fluids.

This is what may be called defending the diseased Part; it is necessary therefore to banish all Astringents, and Plaisters. The White of an Egg, for Example, like Oil, is mucilaginous, and proper to preserve the Suppleness of the Fibres; the Yolk is anodyne; Brandy is diaphoretic. It is also very proper to moisten the Bandages, and for Want of it, warm Wine is used. These Liquors serve also to clean the Part from the Filth collected there.

After all these Reflections, let us now examine how the first Indication ought to be answered. First, the superior Part of the Fracture must be held so firm, as to be immoveable, and is what

what is called Counter-Extension. Secondly, the inferior Part is to be pulled until the Bone be disengaged, and brought opposite to the superior, to be replaced, and is what is called Extension. Thirdly, the Extremities of the fractured Bone must be adjusted to the natural Figure and Situation of the Part; and if there are Splinters, the Business is to reduce them to the Level of the Bone, and is what is called Conformation. The Conformation is made with the Palm of the Hand, the Ball of the Thumb, and the Fingers; but we are not to amuse ourselves with handling the broken Part too much; if we make the Extension of the Piece, and give it a little Play, it will be easily enough reduced by the mere Elasticity of the Muscles, which will bring it back opposite to the superior: Now this Play depends upon the Dexterity of the Surgeon.

In order to make this Reduction, First, the Patient must be in the Place and Situation he ought to remain in during the whole Cure; Secondly, it is absolutely necessary that the Ends of the fractured Bone be drawn with the same Degree of Force, for if the superior Extremity is not strongly fixed, those who make the Extension would rather drag it along, and the Body too, than draw the inferior Part of the Fracture towards them. The strongest and most expert Assistant is to make the Extension, for the Manner of pulling is of great Consequence. Thirdly, the drawing Powers should always be applied to the broken Ends, otherwise they would be useless. Fourthly, they are always to surround the Part of the Bones the least covered with Flesh, which is towards the Epiphyses; because otherwise the Ligatures would only pull the Fat and Muscles, and not hold the Bone firm. Fifthly, the Extension, and Counter-Extension ought to be proportioned to the Displacement of the Pieces of the fractured Bone, and to the Force and Thickness of the Muscles of the wounded Part, which resist the Extension. Sixthly, the Extension is almost always necessary, except in Fractures where the Pieces are not out of their Place; and it must be done gradually, in order to give the Muscles Time to yield to the Force that stretches them. Seventhly, let the Pieces be ever so little displaced, the Extension is necessary, because the broken Ends being always somewhat uneven; if we force them back by the mere Conformation, some of them sticking to the neighbouring Flesh, might occasion an Abscess, as aforementioned. Eighthly, to make the Conformation, the Extension and Counter-Extension must be sufficient; for it is to be observed that their chief Utility is to adjust the Displacement made according to the Length of the Limb, and that the principal Use of the Conformation is to remedy the Displacing breadth-

breadthwise : Now it is impossible to adjust the fractured Extremities so long as they touch upon the Sides : It is necessary therefore that they be *opposite* to each other, in order to be reduced to the proper Position.

The second Intention in the Cure of Fractures, is to secure the reduced Bone. It is accomplished as much by the Dressings as by the proper Situation.

The Apparatus consists of Compresses, Band, Splints, Paste-Boards, Ligatures, Junks, &c.

The Bands must be made of Linen half wore, that they may be more pliant, and softer. Secondly, it is to be clean and white. Thirdly, it should be even, intire, and close, cut straight, because what is aslope yields, and tears. Lastly, these Bands must be without Hems, or Selvages, because neither of them stretch out ; thus being firmer than the Middle of the Band, they bind fast by the Edges, and the Middle remains loose, which is greatly to be feared in Fractures, where the Middle not binding sufficiently hard, the fractured Ends may displace.

Let us at present examine, what Care is requisite in applying each Particular of the Apparatus, and let us choose for Example a Fracture of the Leg, four Fingers Breadth above the Joint of the Foot.

The Hair, if there is any, must be shaved off, for two Reasons : First, that the Medicaments may not stick to it, and that the Dressings may be removed without Pain : Secondly, to open the Pores of the Skin, which facilitates the Transpiration, and Penetration of the Remedies.

The Part being placed in the most natural Attitude, one of the Assistants is to embrace the superior Part of the Limb, below the Knee, keeping his Fingers expanded under the Ham, and his Thumbs crossed below the Rotula. Another must do the same, keeping his Fingers expanded upon the Tendo Achillis, and his Thumbs crossed on the anterior Part of the Leg. Both must be steady ; they are to keep the Part extended, and raised in the same Situation, without stirring, whilst the Surgeon dresses, and bathes it with warm Wine, or other Liquor, as before mentioned.

As we are sometimes obliged to keep this Part a long Time in the same Situation, and as that of the Assistants, who perform this Office, is very irksome, the Operator must have an Eye upon them, and change them, when he judges it necessary.

The Part is covered with a Compress wet in the Defensive, which must be simple. In order that the first Band may join closer to the Part it is to embrace, it should be slit at

one or both Ends, that it may apply more evenly; and as it is designed to remedy the Disorders of the Teguments, we wet it in a proper Liquor.

When the Fracture is near the Calf, this Compress is cut in several Places, that it may embrace better, otherwise it would bind too tight, and the Part below would be too loose. It is inverted for the same Reason. The two first Bands must be wet in warm Wine, or other Liquor, and well squeezed. The first is applied upon the Fracture. It's Middle is to answer to the Center. Three circular Turns are made: They serve to secure this Place, which alone wants to be confined, as being the only one liable to be displaced, and to stop the nutritive Juice, and prevent it's ouzing out too copiously, and irregularly round the Fracture, which would make a very deformed Callus.

Circulars, and not Spirals, are first made, because the first are firmer; and three are made, in order that by multiplying the Turns of the Bands, they may hold firmer, and better secure the broken Place.

The Band is carried up by Spirals, more or less close, according as it is necessary to bind the Part more or less tight. It is inverted where the Leg is uneven, or else the Bandage would not bind equally as it ought to do. These Circulars are begun towards the lower Part of the Calf, where the Leg begins to grow thicker, and so made, that their Middle may meet at it's posterior Part, and be all placed in the same Line, in order the better to fill up the Vacancy. The Band is carried to the superior Part of the Leg spirally, and fastened by some Circulars. If upon Account of a Contusion, that Part of the Leg was very large, it would not be necessary to invert it.

After which another Band longer than the first is taken, with which two Circulars are made upon the fractured Place, in order to strengthen the three of the first Band. It is carried down in a spiral Course, to secure the inferior Part of the Leg, and Care is taken not to cover the Malleoli, provided the Fracture be at a reasonable Distance from them; for if it was very near, we should be obliged to pass the Band over, taking the Precaution to guard the Part, and bind it loosely. One Cast of the Band is passed about the Sole of the Foot in Form of a Stirrup. This Turn secures the Spirals made in descending, and those necessary to be made in ascending. After which it is carried upon the Instep, where we make a St. Andrew's Cross; it is carried up by Spirals, and finished where the other Band ended.

After these two Bands, a circular and graduated Compress, that is whose Thickness increases by Degrees; it is applied,

applied, if necessary, to the sound Leg, which ought always to serve as a Pattern whereby to cut the Dressings, that must be used, regularly; for it is to be more or less thick, according to the Largeness of the Calf. It is applied to the inferior Part of the Leg, to render it round, and equal to the superior. It is placed immediately above the Malleoli, and in such a Manner that the two Extremities may meet at the internal Part; whereby the longitudinal Compresses placed above press equally in their whole Length.

Longitudinal Compresses are used for the Sake of better securing the Part, and all the Circumvolutions of the two first Bands. Three of a proper Breadth, and Thickness, are necessary. They are about three of the Patient's Fingers broad, and seven or eight Folds thick, if the Linen is moderately fine, and four if it is coarse.

One is placed upon the internal Surface of the Tibia, another on the opposite Side, and the third underneath, which ought to be thicker below, the better to fill up this Place, and level it. There must be some Distance between the Compresses.

Few Practitioners make Use of Splints; our Paste-Boards supply their Place. Hippocrates, and all the Antients used them. They are made of a light and pliable Wood, such as Beech, of which Scabbards are made; whence it is commonly called Splint Wood. They must be thin, rounded at their Extremities, and shorter than the Bandage. Some apply them upon the Compresses, others put them in the outmost Fold, and secure them by some Stitches, that they may neither slip upwards, nor downwards. When a lively Child, or a Patient of a more advanced Age, and of an unruly Disposition, is treated, Splints are used, the better to keep in Order, and secure the reduced Parts. They are also used in Fractures of the Thigh, on Account of the great Thickness of the Muscles. After which the longitudinal Compresses are secured by the third Band. Some Surgeons begin by a Circular upon the Fracture; but, we generally content ourselves with applying it to the inferior Part of the Leg, and ascend by Spirals, 'till we come just below the Condyles, where we finish it. Those who make a Circular upon the Fracture mean to bind it still more: But that is an Error.

Some cover all this Apparatus with a Piece of Linen, wet in the White of an Egg; it is neat, but not necessary.

In Case we have not placed the Paste-Boards, two are to be applied upon the third Band. They must be cut in Proportion to the Thickness, and Length of the Leg, and sufficiently broad to surround it without touching, when tied.

Their

Their inferior Part must be notched in Form of a Crestent, that they may not press upon the Malleoli. These PASTE-Boards are wet in Wine, or other Liquor, to make them more supple, whereby in moulding to the Figure of the Part, they apply more easily upon the Dressings, and as they dry they compress equally throughout. They are tied with three small Pieces of Tape, beginning with the middle one, and the Knots are made on the external Side of the Leg. The Leg is laid at length quite extended in the Junks, which rest upon a soft Pillow, and of an equal Length, but more raised towards the Foot. The Vacancy from the Knee to the Calf is filled with Compresses, or little soft Cushions, that the Leg may be supported in its full Length; and we particularly guard the Ham, for it ought to be well sustained.

As in all Species of Fractures, the superior and inferior Joint must be kept in a Sort of Inflexibility; the Junks are to reach a little beyond the Sole of the Foot, and above the Knee. Whereby they will be but as one Piece, stiff, and inflexible.

To fill up the Vacancies betwixt the Junks and Leg, a large Compress is placed on each Side; the one upon the anterior, and the other upon the exterior Part of the Ankles. The Knee is guarded in the same Manner; by this Method the Junks apply equally throughout. These Compresses are made of a proper Thickness to elevate the Junks, and prevent their pressing upon the Ankles, the Condyles of the Femur, and upon the Head of the Fibula; then they are rolled up as much as is necessary.

The Fore-Part of the Leg, which the Strings of the Junks are to cross, is guarded with a thick Compress, that reaches from the Knee to the Instep. This Compress serves to defend the Crista of the Tibia, and prevent the Ligatures of the Junks from incommoding, and compressing too much.

Before the Sole is placed, the Foot is surrounded with a double Compress, crossing it upon the Instep, to give the Liberty of examining it, when thought necessary. The Junks are tied with four Pieces of Tape. We place three along the Leg at equal Distances, observing that the lowest be not too near the Joint of the Foot, nor too tight, for Fear of hurting the Malleoli, and making the Foot swell too much. The fourth is placed above the Knee. The Knots are made as those of the PASTE-Boards.

By the Situation the fractured Part is necessarily obliged to keep; the Heel is supported a long Time upon the same Place, whereby the Tendo Achillis is pained, and easily excoriates.

To remedy which, it must be sustained upon something that has Suppleness, Consistence, and Elasticity. Sponge has all those Advantages. Some make Use of false Junks, others of soft and flat Rollers; others of round, which have the same Uses. They are made of a Band rolled into equal Heads, fastened together, and long enough to reach as high as the Commencement of the Calf. The Heel being lodged between these two Rollers, the Tendo Achillis does not suffer, because it bears, as it were, hollow. After this the artificial Sole, provided with it's Compress, is applied to the Sole of the Foot, and with two Ribands to fasten it with Pins to each Side of the Junks, crossing them upon the Leg. This Sole serves to keep the Foot in a proper Situation. It is really troublesome, but it is very necessary to counter-balance the Action of the Extensors of the Foot; that is, it obliges the Tendo Achillis to elongate, otherwise it would shorten too much, so that after the Cure the Patient would be unable to walk, except upon his Toes.

To render this Situation less irksome, we must be contented to master the Tendo Achillis gradually; but towards the End it ought to be more forced, in order to preserve it in it's natural Length.

To secure the Leg, and Foot from the Weight of the Bed-Cloaths, we place a Hoop, or Ozier Cradle, &c.

The Patient must be laid straight upon his Back, his Head moderately raised according to his Ease. As for the diseased Leg, it is always to be kept a little raised towards the Foot, to favour the Return of the Fluids.

The Patient being thus placed, and all this Apparatus applied, the diseased Part is secured against all Injury.

To prevent Symptoms, it is necessary to have Recourse to Bleeding, and Diet. If the Patient is young, strong, and plethoric, he must be bled in the Morning and Evening; which should even be repeated the next Day. His whole Nourishment should consist in thin Broths, that is, not rich in Gravy, which he is to take every four Hours, and his Drink a common Ptisan. He must be kept open by Clysters. By diminishing the Mass of Blood, it will lose of it's Impulse, and by diluting it, it will flow with less Force into the wounded Part, and irritate the Fibres less; besides, it will be more fluid, and less capable of forming Obstructions.

We are to be very careful to visit the wounded Part, that we may be assured, by examining the Foot, of the Effect of the Bandage; and, if it was the Arm, by examining the Hand. The Bandage must be neither too tight, nor too loose.

The

The Gangrene is the first, and most dangerous Inconvenience. It is known by the livid Colour of the Inſtep, with Coldneſs, dull Pain, and Weight. The Day following the Part becomes œdematous, and from a red inclines to a violet Colour. Vefications more or leſs, according to the different Degrees of Compreſſion, appear; and, laſtly the Part ſoon becomes very hard.

In ſuch a Caſe, it is to be quickly ſet at Liberty. It is bathed with Sp. Vin. camphor. & Sal. Ammoniac, or with Vin. aromat. and it is bound up more looſely. If the above mentioned Accidents ſhould happen, the Means of remedying them ſhall be offered, when I come to treat of compound Fractures.

When the Bandage is well applied, the next Day we ſee the Figure of the Part is not changed, and that below the Bandage is a little ſwelled, but without Pain, Tension, and Numbneſs.

This Swelling comes on by the moderate Compreſſion of the Blood-Veſſels; and when there is none, it is a Proof, the Bandage is too looſe, and that, ſo far from being tight enough to ſecure the reduced Bones, it is not ſufficient to compr'eſs the Veſſels moderately. Then it muſt be undone, and applied properly.

It is eaſy at preſent to perceive the different Advantages of Bandage. Firſt it ſerves, as above mentioned, to ſecure the fractured Place; Secondly to keep in the nutritive Juices, and conſequently to prevent a deformed Callus. Thirdly, to moderate the Courſe of the Fluids by compr'eſſing the Veſſels gently and lightly, and of courſe to prevent an Abceſs, and Fluxion, which threaten the Part; Fourthly, to overcome the Elasticity of the Muſcles; for by this eaſy Preſſure they cannot exert their natural Spring with ſo much Facility; and, as in moſt Fractures ſome are half diſplaced, and the Fibres of others dragged, the Bandage keeps in the one, procures the Fibres of the others a Repoſe very proper for their Re-eſtabliſhment, and maintains all in their natural Situation, which is abſolutely neceſſary to the free Exerciſe of their Functions.

Motion being very much againſt the Re-union of broken Bones, the Surgeon ought to dreſs his Patient ſeldom, and not remove his firſt Dreſſings 'till after ſeven or eight Days, unleſs the Symptoms oblige him; viz. if the Patient feels great Pain; or very troubleſome Itchings, frequently occaſioned by Vefications; or if the Part be ſhorter, or awry, or if it be greatly ſwelled, and diſtended below, or the Bandage be undone, either by the bad Situation of the Patient, or by the Shocks occaſioned by ſome bony Points, Convulſions, or by the Startings of the Part; a Symptom inſeparable from moſt Fractures, and

which commonly happens during Sleep, when the Patient is the most calm, and the Bandage well applied. Wherefore the Surgeon does not make himself uneasy; but contents himself with forewarning the Patient of it, lest he should be alarmed. The Surgeon may also be obliged to remove his Dressings, because the Bandage is become too loose, by Reason of the Decrease of the Swelling, which is sometimes very considerable when the first Dressings were applied, but is dispersed a short Time after.

Although the Pain be violent for the first Days, it is sometimes proper not to be too hasty to touch the Bandage. We content ourselves at first with untying the Junks, if that is not sufficient, we undo the Paste-Boards, and even loosen the third Band. By this Means the Pain frequently ceases; but, if it continues, it is a Proof of it's being occasioned by the Compression of the first Band, and then the Bandage must be re-applied, and kept looser; or it is owing to an Erysipelas; in which Case we are frequently obliged to remove the Bandage, and make Use of the eighteen tailed one.

The Surgeon is afterwards to dress his Patient more or less frequently, as he shall judge necessary: and at every Removal of his Dressings, he must take the same Care as at first, and apply them in the same Manner. At the second Dressing the Bandage is to be kept a little tighter, the better to secure and confine the Pieces, and prevent the Extravasation of the Calus. It is to remain on as long as possible.

At every Dressing the Part may be bathed with warm Wine, and Brandy, as well to strengthen it, as to remove the Itching, and Filth collected there. We are carefully to examine for the first Days whether the Foot be not turned too much outwards, or inwards; which generally proceeds either from the bad Position of the Leg, the Restlessness of the Patient, or from the Ribands, which secure the Sole, being unequally tight or loose. Then it is necessary to replace the Leg, and Foot in their natural Situation, and secure the Sole in a proper Manner. The Foot is known to be well situated, when the great Toe answers to the Center of the Rotula.

It is proper to give a Reason for this Situation, and therefore it is necessary to remark that the Tibia, and Fibula, are not in the same Plane, the Tibia being more forwards, than the Fibula. So it is not the Middle of the Foot that should be made to answer to the Middle of the Knee. It is also right to observe, that the Condyles of the Tibia are in the same Plane; but in the Joint of the Foot, the Malleolus externus descends lower than the Extremity of the Tibia.

It is likewise necessary to take Care that the Patient be so placed that one Buttock be not lower than the other, and that the Leg answer to the Thigh of the same Side; lastly, that being laid, the whole Body be in a strait Line, and that the Eye look directly at the great Toe.

Let the Surgeon take what Precaution soever he will, the Patient is frequently incommodated in the Heats of Summer with an Itching, occasioned in general by Vefications, which, swelling, and enlarging, let a considerable Quantity of the Lymph extravasate, which, heating, produces a Kind of Erosion in the Skin. Then we are to undo the Bandage, and dress more frequently. The Leg is bathed with Aq. Alumin. or Aq. Calc. sharpened with a little Brandy; and we cover the excoriated Places with Cerate spread very thin, or with drying, and absorbent Plaisters. Such are those of Diapalma, or Cerufs, &c.

One of the chief Things to be attended to in the Cure of both simple and compound Fractures, is to situate the wounded Part, and Patient properly; and on this frequently depends the good or bad success of such Fractures.

This Situation is not always the same, it is different according to the Variety of Parts. The Patient, for Example, in Fractures of the Thigh, Leg, &c. must very exactly keep the Bed, and the same Situation, until the Callus be well formed; and this is to be much more carefully observed in a transverse Fracture of the Rotula; for, as the Aponeurosis of the Extensors of the Leg is strongly attached to it, and the Portion of this Aponeurosis, lacerated in the Fracture, has no other Support than the Part of the Rotula, by which it adheres; if the Callus is not well hardened, the superior Piece separates from the other upon the least Force. The Patient on the contrary can walk when the Arm is fractured, but he ought not to make Use of it 'till the Callus be formed.

As in every Joint, some Muscles are stronger than others, and carry it against the Antagonists, it happens that our Limbs, left to the simple Equilibrium of the Muscles, affect a certain Attitude, which is observed regularly in those, who sleep calmly in their Beds. Therefore in Fractures of the Arm, or fore Arm, the Arm is to be gently extended, and the Elbow a little bent, the Radius slightly turned inwards, and the Fingers a little bent, and the Arm is to be kept in a Sling, whether in Bed, or up. In Fractures of the Thigh, Leg, Rotula, &c. the Thigh, and Foot must be gently extended, and the Knee slightly bent. The Surgeon ought to pay great Regard to all these Situations, before he makes his Bandage; and before he applies it, he should place the Part in the Si-

tuation it is to be kept in, otherwise the Bandage would be either too tight, or too loose, when after it is applied he would place it properly.

In a Fracture of the Thigh, and Leg, it is necessary to have a strict Eye to the Heel, as before mentioned. The same Attention must be paid to the Olecranon in Fractures of the Arm, and fore Arm. This is what I had to say upon simple Fractures; let us proceed to compound.

CHAP. III.

Of compound Fractures.

IT has been said, in speaking of the Differences of Fractures, that by Reason of Accidents they are divided into simple and compound. It is necessary to remark, that in the Affair of Fracture, the Word compound may be taken in two Senses; either in Respect to the Accidents accompanying a Fracture, each of which furnishes a particular Indication, which cannot be answered either at the same Time, or by the same Remedy, or Treatment; or in Respect to the Difference of Bandage used to dress the Fractures of the large Bones of the Extremities.

It has also been remarked that there are two Kinds of Bandages, the one simple, and the other compound, and that this last is chiefly proper on three Occasions: First, when we are obliged to dress a Fracture frequently, such are Fractures accompanied with Wounds, a Phlegmon, violent Contusion, &c. Secondly, when a Fracture is so situated, that it cannot be bound up without being exposed to a Displacement of the Pieces; such are the Fractures of the Thigh, and Arm, near the Joint. Thirdly, when the Fracture is oblique, although it be simple, and without any other Complication.

The Diseases which render a Fracture compound proceed, either from a general Dèpravity of the Fluids; or the Part itself. The first are occasioned by an Overfulness of Blood, which subjects the Patients to Inflammations, and phlegmonous Tumors; or by a Superfluity of acrid, and saline Humors, which subjects them to Tetters, Itchings, to an Erysipelas; or they are owing to too much Lymph, from whence proceed Cedemas, &c. or else they depend upon a Blood tainted with a venereal, scorbutic, or scrofulous Virus, which threatens the Part with a Caries, obstinate Abscesses, a Node; or upon a

gouty

gouty Humor, that may produce Collections of Matter upon the Fracture; lastly, the Patient may be seized with a continual Fever, or an inveterate Diarrhœa, which waste, and vitiate the nutritive Juice.

In all these Cases, although there be nothing to fear from the Fracture, it is nevertheless necessary to visit it frequently, to be enabled to guard against the threatening Accidents; this proves the Necessity of a Bandage with many Heads.

The Diseases depending upon the wounded Part, and which render the Fracture compound, respect the soft or hard Parts. They may also be complicated by the Cause of the Fracture, as when a Musket Ball is lost in a Limb, after having broken and shivered the Bones.

The Disorders accompanying those of the soft Parts are either a Contusion, Wound, or Ulcer. The Contusion, and the Maladies it causes, have their Effect in the Skin, from whence proceed Itchings, or an Erysipelas; or in the Fat, which occasions an Œdema, or a Phlegmon; or in the Muscles, which makes them swell, harden, and soon mortify, without shewing any Sign of Suppuration; or this Disorder respects the Arteries, which causes aneurismal Tumors, or it intirely suppresses the Course of the Fluids, in either of those Parts, from whence comes the Gangrene.

The Diseases produced by the Wound are an extraordinary Hemorrhage, a Loss of Substance, a violent Contusion, extraneous Bodies, or a considerable Laceration made by Gun-Shot, or this Wound uncovers the Bone, which is likewise contused. A Fracture free from these Accidents is considered as simple.

The Disorders, proceeding from the Bones, respect the Maladies that have preceded the Fracture, such are Caries, a venereal Exostosis, or the Luxation of the superior, or inferior Joint; or else they only relate to the Fracture itself, in which three Things ought to be considered, viz. it's Situation, Figure, and Splinters.

By Reason of its Situation, the Fracture of the Arm, or Thigh, near the Joint ought to be looked upon as compound.

On Account of it's Figure, the oblique may be ranked in the same Class, particularly that of the Thigh.

By Reason of the Splinters, the Fracture may be complicated relatively to their Number, Figure, Distance, Situation, or because they are stript of their Periosteum.

The Causes of these Fractures are external, or internal.

The external, which are very frequent, are Blows, Falls, but particularly Gun-Shot.

Amongst the internal, the Caries is the most common. It either depends upon a general vitiated State of the Fluids, as in the Lues venerea, Scurvy, and Scrofula, or a local Fault of the Part; for Example, a violent Contusion of the Periosteum, or a Collection of Matter betwixt it and the Bone, or some old Fistula in the Neighbourhood of the Bones.

As to Caries depending upon a local Viciousness of the Part, they may proceed from the Inflammation of the internal, and external Periosteum.

The first Kind are occasioned by the Inflammation and Putrefaction of the internal Periosteum, or Cellular Texture of the Marrow; then the Pain is dull, deep, and fixed; it neither increases by the Pressure of the Parts covering the Bone, nor by that of the external Periosteum, and all the topical Applications afford it no Relief; nevertheless the Bone is so eroded by Degrees, that there only remains a very thin Plate that is found: Wherefore it fractures there upon the least Force; even those to whom that Misfortune happens being unable to foresee it.

There is no Surgeon, but who has seen Examples of it, either in the Femur, Humerus, or Tibia; the Caries eats away one intire Side of the Bone, and it fractures upon the least Motion of the Patient.

When the Caries begins by the Inflammation of the external Periosteum, the Pain is not so deep, but it is infinitely more violent, by Reason of it's close Connexion with all the Tendons of the neighbouring Parts, and it's extreme Tension: Besides, it increases by the Pressure of the Part.

Sometimes the Blood, being loaded with an acrid and burning Matter, critically discharges it betwixt the Bone and Periosteum only, or at the same Time upon the soft Parts covering it. These sorts of Abscesses being opened, the Bone is found so carious, and eroded, that upon it's being moved, it breaks into two, or several Pieces. I have related such an Example before, taken from Paré's Treatise of Fractures.

Compound Fractures are known, not only by the Signs mentioned in speaking of simple ones, but also by the Sight, when the Wound is large, and very open; and by the Touch of the Finger, or Probe, when they can be introduced into it, where Inequalities, or a Depression of one or several bony Pieces are felt. Their Causes assist us also in discovering them. For Instance, if it is a heavy Load that has fallen upon the Part, or the Wheel of a Coach or Cart, heavy loaded, has passed transversely over the Limb; there is no Necessity of seeing the Fracture, to judge that it is compound. It has already been observed, that an oblique Fracture is known by the great Shortening

Shortening of the Limb, the Enlargement of the Place where it is found, and by the Facility wherewith the inferior Part mounts upwards, as soon as the Extension is left off.

In order to make a just Prognostic of these Fractures, we are carefully to attend to their different Complication. To succeed therein, let us not lose Sight of the Plan we have formed, and let us begin with the Diseases depending upon a general Indisposition of the Fluids.

It is certain that the Lues venerea, the Scurvy, and Scrophula, render the Re-union of broken Bones much more tedious, and difficult.

Great Weaknesses, especially when occasioned by a continual Fever, an inveterate Diarrhoea, or by a too frequent Commerce with Women, likewise render the Cure of Fractures very long, and troublesome; because the Blood is impoverished, and intirely deprived of it's balsamic and gelatinous Part, and the Body is exhausted by all the preceding Evacuations.

In Respect to the vitiated State of the soft Parts, Fractures complicated with different Diseases, and troublesome Symptoms, as an obstinate Erysipelas, an Inflammation, a violent and deep Contusion, acute Pains, are of very difficult Cure. They are even dangerous on Account of the contrary Indications, which must be answered at the same Time. On one Hand the Fracture requires a Bandage that compresses sufficiently, to secure the Pieces well; and on the other, the Symptoms require that it be kept loose, until they be appeased. Nevertheless, who can be sure that the Pieces will remain adjusted?

Fractures accompanied with Abscesses, deep, and adjoining to them, are very troublesome; because the putrid Matter mixing with the Callus, vitiates, and keeps it in a continual Running, which rots the Ends of the Bones.

The same Prognostic must be made of Fractures with Wounds, and which are greatly shivered; and of those where a considerable Portion of the Bone is stript of it's Periosteum.

As to Diseases preceding the Fracture, it is easy to judge that if the Caries is simply owing to a particular Indisposition of the Part, and does not affect the whole Thickness of the Bone, that it's Cause is external, and the Habit of Body being otherwise sound, it may be hoped, that after having procured an intire Exfoliation of the carious Portion, the broken Parts will re-unite; but if the whole Bone was carious, it would be necessary to proceed to Amputation.

We have said that, in Respect to the Fracture, three Things rendered it compound; its Situation, Figure, and Pieces. Let us also draw our Prognostic from these three Articles.

As to its Situation, we have already remarked that all Fractures, both of the superior and inferior Extremities, are very dangerous, and painful; because the Tendons, Aponeuroses, Ligaments, and Nerves are greatly concerned, and their Synovia is thereby discharged, which, flowing upon the Fracture, and becoming acrid, may gangrene the Muscles, and render the Bones carious. These Fractures also are not treated without much Trouble, on Account of the Difficulty in handling, and binding them without displacing them.

When I speak here of the Discharge of the Synovia, I do not mean that contained within the Joint; for I suppose it is not open, but that which lubricates the Tendons, and Aponeuroses, which, being irritated, weep, as it were, and melt down into Synovia. A little Dust lodged in the Eye, or a little Rad. Pyrethri put into the Mouth, produce a copious Discharge of Tears, and Saliva.

The Fractures of the Joints are very painful, and very difficult to be cured, because all is disordered; Fibres, Fluids, the whole is compressed; from thence proceeds the Obstruction of the Vessels, Tendons, Ligaments, and the extreme Tension of their Fibres, which, as we have already said, produce Anxieties, Watchings, Fevers, Delirium, convulsive Motions, Symptoms inseparable from great Pain, and which soon putrify, and gangrene the Joint, and Fracture.

It follows from thence that the best Indication is to soften, and relax the Fibres, to rectify the Liquors that moisten them, and to endeavour to reinstate them in their natural Pliancy, and Softness. This may be expected from the internal Use of Barley, Rice, and Oat Creams, Emulsions, Syrup. Papaver. erratic. Diacodium, bland Ptisans, and Laudanum, as before observed, because there is found in all this wherewith to calm the Solids, and render the Liquors fluid, and balsamic.

Although the above mentioned Symptoms render the Cure of Fractures of the Joints very troublesome, they are nevertheless cured without having Recourse to Amputation; but that requires all the Attention of an experienced Surgeon; for the Business is to defend a Part intirely surrounded with nervous, and tendinous Fibres, which can neither bear too much Dressing, nor the Admission of the Air, nor humid, and putrefying Remedies.

We will repeat here, that, as the Ankylosis almost always comes upon this Sort of Fracture, the Surgeon ought to make

his

his Prognostic early, by informing the Assistants, that the Patient will be lame, because the Matter proper to form the Callus, extravasating amongst the Pieces of the Joint, necessarily cements them.

In Respect to their Figure, all oblique Fractures, especially those of the superior Part of the Thigh, are very difficult to be reduced, and kept in their reduced State.

As to the Shivers, the Fracture where the Bone is divided into several Pieces, is very dangerous, and difficult to treat, particularly during the great Heats of Summer.

The Fractures, where the Bone is shivered into several Pieces, which lacerate the Marrow, Tendons, and Nerves, or open large Vessels, and those where the Ends of the fractured Bones tear the Flesh, and start out of the Wound they have made, especially if they are caused by Gun-shot, are so dangerous, that the most sure Method is to have Recourse to Amputation, in order to prevent a Crowd of unsurmountable Accidents, which will destroy the Patient, after having made him suffer long and cruel Torments to no Purpose.

When we are obliged to saw the Extremity of a Bone to reduce it, or remove a Portion of the Bone separated in it's whole Thickness from it's Body, it is to be feared that, after the Cure, the Part may remain shorter; and if that happens to one of the inferior Extremities, the Patient may remain a Cripple, unless great Care be taken to keep the Leg and Thigh in a proper Situation by Ligatures, and other Means that shall be proposed. Notwithstanding all these Precautions, it is very difficult to prevent this Accident in Fractures of the Thigh near the Trochanters, or when they are very oblique.

In Fractures where a large Artery is opened, and the Blood cannot be stopt, it is necessary to have Recourse to Amputation.

Fractures beginning by a Putrefaction, and Corruption of the Marrow, are incurable; we must proceed to Amputation.

Let us now examine how all these different Diseases ought to be treated.

We will begin with those depending upon a general bad State, as well of the Solids, as Fluids.

Although there be nothing to fear from the Fracture, it is necessary to guard against the Symptoms that threaten it, and to be ready to apply the proper Topics to it, to prevent them.

In order to determine upon the Choice of the Means that ought to be employed, we are seriously to reflect upon the different Diseases that make the Complication, upon their Causes,

Causes, Motions, and Symptoms; upon the Age, Constitution, Sex, and Manner of Living of the Patient; upon the Nature, and Uses of the wounded Part; upon the Indispositions, it is naturally subject to, and upon the Place where the Fracture is: We must examine what each of these Circumstances shall indicate in particular, and determine thereupon.

But the principal Indication will be to diminish the Quantity of Blood, to prevent the Obstruction of the Vessels which moisten the fractured Part, and it will be perfectly answered by Bleedings, and a proper Regimen.

Bleeding renders the Course of the Blood more free, and calm, as it loses by this Evacuation of its Impulse towards the Fracture; it is no more so impetuous, and no longer shakes the Fibres so violently. It ought then to be repeated according to the Patient's Strength, and Constitution.

As the Symptoms to be feared are a Fever, an Inflammation, and Erysipelas, Pain, Convulsions, it is evident they all require the same Regimen as acute Disease; which Regimen consists in diluting and moistening copiously, in order to re-establish the Fibres in their natural Softness, and render the Juices more flowing and mild, which are carried to the wounded Part, that by their Stay they may neither irritate, nor obstruct. Whereby the divided Solids will have Time enough to repair, and rejoin.

It is necessary therefore to forbid such Patients every Thing that rarefies the Blood, which by it's too great Quantity in the Vessels, keeps them distended, and opposes their Re-union. In short, simple homogeneous, and watery Drinks, and Nutriment, are the most proper.

There are nevertheless Cases where Vulneraries may be successfully employed, viz. when the Chyle is too viscid, or is disposed to change into a Serum, like Whey. Then they increase the Force, and Elasticity of the Solids by their volatile, penetrating, and alkaline Parts: Whereby they break down and attenuate the Chyle, and render it soft, light, and passive, and consequently proper to form the Callus. Decoctions of the Woods have also their Merit.

Besides these general Remedies, it is necessary to employ those, that are the most appropriated to each Species of Disease. For Example, if the Person was attacked with the Lues venerea, it may be discovered by the Nodes, Exostoses, Ulcers, and venereal Warts, which might be near the Fracture; in order to render it's Treatment and Cure sure and easy, it would be necessary at the same Time to overcome the conjoined Cause by every Method that can be made Use of

of in a like Circumstance, refering the perfect and radical Cure to another Time. But if the Virus has only attackt the soft Parts, and not yet reached the Bones, good Success may be hoped, without paying any Attention to the conjoined Cause, unless it be observed during the Treatment, that it opposes the perfect Generation of the Callus: This will be indicated by the bad Juices deposited upon the Part.

What has been just said of the Treatment of Fractures in venereal Subjects, ought to be applied to the Treatment of those of the scorbutic and scrofulous.

Let us now examine how we may remedy the Diseases and Symptoms, depending upon the Indisposition of the Part.

We have seen that there are two Accidents to be feared in Fractures, from the Contusion of the Skin, viz. the Itch, and Erisypelas.

These Accidents may also be occasioned in Fractures by the Application of astringent Remedies, greasy Liniments, and Cerates, as frequently happens by the bad Treatment of Bone-Setters, and ignorant Surgeons.

In all these Cases, the perspirable Matter, which is naturally composed of the most refined Part of the Blood, is stoped betwixt the Epidermis and Papillæ of the Skin; there it heats, and ferments, which produces a very troublesome Itching. It is necessary therefore to have Recourse to whatever can render the Perspiration freer, absolutely rejecting all Plaisters, Astringents, and Oils.

Internally are used tempered Diaphoretics; and for Topics, spirituous, and anodyne Fomentations.

These Inconveniences may also come upon simple Fractures, though free from Accidents, and even when the Bandage is well applied, when the Skin of the wounded Part is moistened with acrid and saline Juices, which consequently subject it to Itchings, and an Erisypelas; because being then more covered, and tighter bound, than in common, it's Pores are half closed. Add that there always is some slight Contusion in the fractured Part; now all these Obstacles determine the Blood to stagnate in the surrounding Skin, and there deposite the acrid Juices with which it is loaded; and it is by the Obstructions there formed, that the Vessels of the Skin being convulsively strangulated, the Blood is there arrested, whereby it reddens, inflames, swells, and rises a little; in short, that an Erisypelas forms, which is more or less considerable in proportion as the Transpiration is more or less obstructed, it fills, and distends proportionably the Vessels with the Juices, it ought to evacuate. Besides, the Blood

Blood is determined to flow there more or less copiously in Proportion as the Papillæ of the Skin are irritated more or less violently.

When in a simple Fracture a moderate Itching is only to be appeased, it has already been said, that we content ourselves with undoing the Junks, and removing the Paste-Boards, in order to wet the Bands, and moisten the Skin, which may be repeated as often as is thought necessary. These Lotions are made with warm Water and a little Brandy, or with warm Wine. But if the Itching is very troublesome and increases, the Part must be set at Liberty, and the Dressings changed. It is fomented with warm Water sharpened with a little Sp. Vin. camphor. or with a simple Infusion of Rad. Althæ. or fresh Frogs, if the Season permits.

When the fractured Part is seized with an Erysypelas, then the necessary Revulsions are to be immediately made by Bleedings, and a very diluting Regimen. The Patient must be bled the first Days, according to his Strength and Constitution. The Ptisan is to be a simple Infusion of Flor. Sambuci, or Aq. alb. Nitre and tempered Diaphoretics must be made Use of, and for Topics the same Lotions, or Aq. Calc. mixed with a little Brandy.

When the Skin is filled with acrid and bilious Salts, and it's Whiteness changes into a deep Yellow, very clear Whey is successfully used, which we order to be taken, at several Draughts in the Morning in the Manner of mineral Waters: Recourse is had to Aq. alb. to very thin and clear Lemonade, to Ptisans with Sal. Nitr. pur. and the same Lotions are made Use of. If the Erysypelas is very humid, and spreading, we dust it over with Test. Ostr. or Cerus. reduced into an impalpable Powder, tied up in a Rag, or Acet. Litharg. weakened with Brandy is made Use of. We also very usefully employ Lap. Medicament.

If the Texture of the Skin is dry, and hard, we are to relax, and soften it with Aq. Ranar. recent, mild Cream, or by Diapalma dissolved in some anodyne Oil, as Ol. Rosar.—Lilii.

All these Remedies by relaxing the Fibres of the Skin, open it's Pores, and facilitate the Transpiration. Lastly, if the Skin is hard, distended and insensible, it is remedied by the Means I shall propose in speaking of the Gangrene.

It has been said, that the Disorders proceeding from the Contusion of the Fat, are the CEdema and Phlegmon. When by a Contusion of the Membrana adiposa, the Blood, Lymph, and oily Juice mix, a Fermentation is produced, which prepares the Matter to a Suppuration, which will be more or less copious, according

according to the different Degrees of Contusion, and Extravasation, and in Proportion as the necessary Revulsions have been early made, by Bleedings, and a very exact Regimen, in order to forward the Suppuration.

In Respect to Topics, we make Use of Resolvents for some Days, and, when we perceive the Resolution to advance too slowly, we are to open the Abscess, especially if it is occasioned by extravasated Blood, which never suppurates; after which we dress it as in common.

If we observe the extravasated Matter disposed to suppurate, it must be forwarded by emollient Fomentations, which produce the same Effect as Cataplasms, only a little more slowly. They are sharpened by mixing Absinth. Ros. Flor. Chamœmel. Melilot. & Flor. Sambuci. The Reason why Cataplasms are not employed, is, because they take up too much Room, render the Bandage useless, and oblige the Surgeon to change the Dressings too often, particularly when a Cataplasm of Bread and Milk is used. Frequently it heats, and becomes sour, and crisps the Skin, which requires it's Removal every four Hours, particularly in hot Weather.

If we prefer an emollient Lotion, we wet very thick Compresses in it. We are to apply the Liquor warm upon the Part.

When the Abscess is superficial, there is nothing to fear; but if it is deep, and near the Fracture, it's perfect Maturity must never be waited for in order to it's being opened; because the purulent Matter falling upon the Periosteum, erodes it's Vessels, and stripping the Bone, renders it carious, or else insinuates into the Interval of the Fracture, corrupts the nutritive Juice, and keeps it in a continual Discharge, and even rots the Ends of the fractured Bone.

Very great Care is necessary to prevent too large Suppurations, because they destroy the Constitution, and Tone of the Part, and weaken it by depriving it of the greatest Part of it's Nutriment. To avoid this Inconvenience, too frequent Dressings, greasy, emplastic, and putrefying Remedies, too tight Bandages, and tenting of the Wound are forborn. Nothing so much diminishes too copious Suppurations, as a very strict Regimen, and the Use of Vulneraries, and Absorbents.

Sometimes these great Suppurations proceed from some deep Sinuses that cannot be discovered; such as those in the Middle of the Thigh, under the Flexor Muscles of the Leg, or in the Calf under the Gastrocnemius.

To remedy which, the Sinuses are compressed at the Dressings, in order to empty them; they are deterged by Injections

tions, the Lodgment of the Pus is prevented by an exact Application of Compresses, which are kept on, and secured by the Bandage, and we wet them in warm Wine, Brandy, or Sp. Vin.

If those deep Sinuses were so situated that they could be opened, a Counter-Opening should be preferred to the Compresses: But here I *peak only* of Sinuses that cannot be opened, as those near large Vessels.

All Abscesses coming upon Fractures ought not to be considered as bad Accidents, for Nature frequently makes Use of them as a Means to calm the present Symptoms, and prevent those, which there is Room to dread. For Example, if there is any considerable Tension in the wounded Part, the Swelling, and Pain commonly cease after the Opening of the Abscess, which secures it from the Gangrene.

Frequently after an Abscess has been cured many Months, and even several Years, an Inflammation appears at the Place of the Fracture, or thereabouts, which produces a Suppuration. This Accident is merely caused by a Splinter, or a Portion of the distempered Bone, whereby it discharges itself.

When by a Contusion of the Fat, Lymph alone is extravasated, it causes the Oedema, which so commonly accompanies Fractures, even the most Simple, particularly at the Beginning.

Vin. Aromatic. is made Use of to disperse it. If that is not sufficient, we make a Lye with the Salts of aromatic Plants; or we mix Aq. Calc. with a Lixivium of Vine Branches, or a Solution of white Soap.

When the Disorder, occasioned by the Contusion, has reached to the Muscles, they quickly inflame; because the Vagina enveloping them being in great Tensions, binds them so closely, that all their Vessels are thereby strangulated; From whence comes their Obstruction, and the enormous Tension of their Fibres, and it is this, that renders their Inflammation so dangerous.

To remedy which, Recourse must be had to Bleeding, and Diet. The Bleedings must be sudden, and quick; because the Blood very easily breeds again. Recourse is had to nitrous Drinks, Dissolvents, and tempered Diaphoretics, as Sperm. Ceti, mineral. diaphoretic. very clear and weak Broth, Diacodium, anodyne Tinctures, Laudanum; Externally we use powerful Resolvents, as Sp. Vin. camphor. or Fomentations with the aromatic Plants, sharpened with Sp. Vin. & Sp. Sal. Ammoniac.

When these Sort of Inflammations are obstinate, and do not yield

yield to the Revulsions made by the above proposed Remedies; the Muscles soon putrify, and gangrene, without shewing almost any Sign of Suppuration.

To prevent this Accident, which is generally mortal, the Part must be immediately scarified by Degrees to the Seat of the Disease, that is to the Muscles, if absolutely necessary, cutting their Sheaths lengthwise, and setting them at Liberty by some transverse Incisions. By this Means a Passage is given to the corrupted Blood, the Part is cleared, and relieved, which would have been choked up by the Plenitude, and Remedies are applied to the Bottom of the Putrefaction.

Although the Inflammation of the fractured Part be commonly a Consequence of the violent Impression of the external Cause, or attending Pain; it is nevertheless true that in the following Cases, it very frequently happens to the most simple Fractures.

First, when the Bandages have been too tight. Secondly, when Splints and Junks, of too hard and stiff a Substance have been used, or that have been badly covered, especially when they press violently, and bare, upon the Parts of the Bones, that are slightly, or not at all covered with Flesh, as the Malleoli, or the Crista of the Tibia. Thirdly, when the Folds of the Bands, or Compresses are too large. And therefore it is proper to cut off their Salvages, Hems, and Seams; because they contuse, which is soon succeeded by Vefications: But nothing is so dangerous as a too tight Bandage.

Daily Practice presents but too many melancholy Examples, particularly in Gun Shot Wounds, where the wounded Limb swells more and more; whereby a Bandage, although moderately tight, becomes insupportable from one Dressing to another.

It has been observed that a Gangrene frequently follows upon great Inflammations and Contusions of fractured Parts, and even their Erysipelases, when badly treated.

In all the abovementioned Cases, the Vessels are so compressed, and obstructed, that the whole Limb swells, and inflames, and all it's Fibres are so forcibly stretched, that it suffers very violent Pains, which press and force the Parts, and push the Obstruction to such a Degree, that the Inflammation soon changes into a Mortification, and as the Skin suffers most, it becomes of a dirty and blackish White, and the Serum oozing from it's Papillæ, instead of being clear, and white, becomes red, and, collecting into little Drops under the Epidermis, it raises it, and forms Blisters, called Vefications, which are very like those that form in Burns. Then the Pain, Heat, and

Pulsa-

Pulsation, cease, the Part changes from a red to a pale and violet Colour, it becomes soft and flabby; and when the Mortification is compleated, the Fever becomes acute, and accompanied with Syncope, Vomitings, and the Hycup; Symptoms that indicate an approaching Death.

If we find that the Vessels of the wounded Part are totally obstructed, it will be easy to judge that, to prevent all those Symptoms, Bleeding frequently repeated, is of great Service here; and that Cordials, Sudorifics, and Vulneraries are absolutely necessary to preserve the principal Organs from the fatal Effect of the Poison, which forwards the Mortification.

If the Skin is benumbed, and whitish, the Vescications will appear sooner or later, according to the different Degrees of Compression. In which Case it must be bathed with Sp. Vin. sharpened with Camphor, Myrrh, and Sal. Ammoniac. If there are Vescications, we open, cut, or tear them with the Point of Scissars, or the Nails, to give an immediate Vent to the Caustic Lymph, which fills them, lest it should erode the Texture of the Skin; and as it congeals by it's Stay, the whole Extent of the Blister in the Epidermis must be intirely cut without Hesitation.

If the Epidermis is raised, and we see little superficial Ulcers in it, the Part is bathed with Aq. flav. or Sp. Vin. camphor; and if it appears hard, distended, and stiff, it is scarified more or less deep, in Proportion to the Degrees of Mortification, in order to give the Opportunity to apply the Remedies to the Bottom of the Putrefaction. These Remedies must be warm, spirituous and penetrating, so as to put the Fluids in Motion, whose Course is rendered more free by the Incisions, and to recall, and revive the natural Heat almost extinguished. The scarified Part is fomented with warm Tinct. Myrrh, and Aloes, or with Theriac mixed with Sp. Terebinth, dissolved in Sp. Vin. camph. with Aq. Calc. mixed with the same Spirit: or with Aq. flav. sharpened with Sp. Vin. After having bathed it with these Liquors, Pledgets are dipt in it, mixing Vin. Aromat. therewith; the Incisions are dressed with it, and the whole Apparatus is wet with it, by pouring upon it several Times Day and Night.

If it is a dry Gangrene, the Part must be instantly scarified, and the Skin is even to be raised and removed, which would shortly become as hard as Parchment: This would occasion the Fluids to stagnate, and produce terrible Accidents.

This done, the Part is moistened with Sp. Vin. camphor, and the Pledget is spread with Ung. de Styrac. or Balsam.

Arcæi,

Arcei, or Emplast. Andreas a Cruce, dissolved with Ol. Hyperic; after having taken Care to scarify, or cut, the gangrened Place, to give the Medicaments Room to penetrate to the quick, and more easily throw off the Eschar. When it is fallen, the Use of spirituous Vulneraries are resumed.

As the dry Gangrene is generally occasioned by a Fall, or violent Blow, and perpendicularly, for Instance, the Kick of a Horse, or when we fall firm on the Feet upon hard and smooth Bodies, it would be difficult enough to remove the Skin upon the Spot; therefore we must content ourselves with making Incisions, and applying to the quick, Pledgets dipt in Vinegar, wherein Sublimat. corrosiv. has been dissolved. These Pledgets are changed, every twelve Hours. The Compresses are also to be wet. Towards the third or fourth Dressing the Eschar which is made in the whole Circumference of the Gangrene appears, and falls of itself. The Patient must afterwards be dressed with the common Remedies.

If the Disorder has reached the Arteries, spurious Aneurisms very frequently form, that is, Tumors made by the Issue, and Extravasation of the Arterial Blood.

If the Fracture is covered, as is supposed here, the Surgeon must examine two Things; First, whether the Tumor is formed by extravasated Blood; Secondly, whether it is arterial. The first Case will be explained in two Ways; First, by the Species of Fracture; for if it is with Splinters, it is reasonable to suppose, that some large Vessel has been pierced by the Point of one of the Pieces, which being engaged in the Artery, causes a continual Effusion; Secondly, by the Cause that has produced it; for Example, if it is made by Gun Shot, there is Room to believe that the Vessel has been lacerated by the Ball, or Point of some Splinter, which may also be discovered by the Instrument; for, if it is very blunt, it may as well lacerate the Vessels, as the Muscles, and Tendons.

Lastly, it will appear whether the Tumor is caused by Arterial Blood, by it's Enlargement from one Dressing to another, under a proper Attention to it's Situation. For Example, if it is in the internal Part of the Arm, and increases much in Size from the first to the second Dressing, it is reasonable to believe, that the humoral Artery has been opened; because there is nothing to be seen near the Tumor that could contribute to this sudden Increase, except the Blood flowing from these Vessels; and which will be more satisfactorily discovered by feeling the Patient's Pulse.

E

Although

Although the general Intention, as well in Fractures, as in Wounds, be Reunion, nevertheless we are daily obliged to dilate, in order to reduce displaced Bones, to extract extraneous Bodies, or Blood, which, when extravasated in Quantity, and coagulated, is one of the Principal of such Bodies; but especially to apply proper Remedies to the Aperture of the Vessels, as in the present Case, where the Fracture is supposed covered. If there is a spurious Aneurism, the Operation must be performed, viz. the Mouth of the Vessel must be sought for, that the Remedy may be applied to it.

There are three Methods to stop the Blood, the solid, or liquid Caustic, Compression, and the Ligature, which is almost the only One to be employed, on Supposition that the Vessel be apparent, and can be tied; for if it was opened between the Gastrocnemii, or at the superior and internal Part of the Arm, or Thigh, Amputation would be the sole Remedy. Indeed the necessary Incisions could not be made for the Search of the Vessel, without greatly tormenting the Patient; and that without Hopes of Success.

As for the other two Means, they can seldom be practised for Want of a firm Support upon a solid Part; for, as we are obliged to keep them on by the Bandage, it cannot be bound so tight as it should be, without risking what we would avoid. It is true there may be Cases, where, we being unable to make Use of the Ligature, might employ a Pledget dipt in Styptic Water, and well squeezed, and supported by several others; they should be raised a little above the Level of the Wound, that the Bandage may compress that Place more than the others; but that Vessel must neither be near the Bones, nor Tendons, nor considerable, for in that Case we should not have the Benefit of the Compression. Indeed a proper Compression could not be made.

The Disorders of the soft Parts are Wounds, or Ulcers. A Wound is simple, or compound, that is, accompanied with an extraordinary Hemorrhage, Loss of Substance, a violent Contusion, extraneous Bodies, or the Bone is bare.

When the Fracture is with a contused Wound, or an Ulcer that must suppurate much, it is necessary to dress frequently, and consequently the eighteen tailed Bandage is to be made Use of, to afford Us the Liberty of dressing the fractured Part without changing the Situation; and it should be continued to the perfect Cure of the Disease. If the Callus was not entirely formed, a rolled Bandage might be applied to assist in securing it.

When

OF COMPOUND FRACTURES.

51

When the Wound accompanying the Fracture is with an extraordinary Hemorrhage, a Loss of Substance, or has uncovered the Bone, the Surgeon must always pursue the general Design, to remedy it. If there is an Hemorrhage; the Blood must be stop'd, and the Ligature always prefer'd to the other Means, when the Vessel can be discovered. If it can, the same Precautions as in an Amputation, and Aneurism, are taken to find it out; viz. we employ a Tourniquet to prevent the Discharge of the Blood, whilst the Vessel is sought for.

It is proper to observe, that in Fractures, as in all Sorts of Wounds, the Surgeon is oblig'd to stop an extraordinary Hemorrhage, before he prepares his Dressings: this he effects by finding out the Place from whence the Blood issues out.

The Violence of the Pains obliges him also to follow the same Rule, for whether they are occasioned by the broken Pieces over-riding one another, or by separated Shivers, that prick the Periosteum, or some Tendon. In the first Case, it is necessary to begin by the Reduction, in the Second, these Fragments must be removed, or their Points cut.

If there are extraneous Bodies in the Wound, as a Bullet, a Stone, the Wad, a Portion of the Sword Belt, or Cloaths, they must be extracted, if possible, according to the common Rules; and if in a Fracture with Wound, one or both Ends of the Bone start out, and after Trial to replace them, it cannot be effected through the Danger of dilating the Wound too much, as when it is very near the Joint of the Foot, or Knee; it should be saw'd, or cut with incisive Pincers, especially if a considerable Portion of each End was stript of its Periosteum.

Even though the Wound should have been made by a cutting Instrument, the most sure Method is always to use the eighteen tailed Bandage, because such like Wounds, being always attended with a considerable Contusion, must suppurate.

Let us at present examine, how the Disorders proceeding from the Bone alone are to be remedied.

We have said that some are produced by the Diseases of the Bone preceding the Fracture, as the Caries, the venereal Exostosis, the Luxation of the superior, or inferior Joint of the fractured Limb.

It is easy to perceive that we are oblig'd in all those Cases not only to attack, and oppose these Diseases, before we work at the Fracture; but also to visit, and dress the Part frequently,

quently, in order to apply the proper Remedies; and consequently the eighteen tailed Bandage must be used. For Example, if there is a Caries with Fracture, it is certain it will never reunite, without Exfoliation. The method to procure it is the exfoliating Trepan, or the actual Cautery: But in this as in all other Cases, the general Intention must always be pursued.

When the fractured Bone is with a venereal Exostosis, it is likewise necessary to visit the wounded Part frequently; because there is Room to fear that the nutritive Juice infected with the Virus may rot the Ends of the broken Bone. The eighteen tailed Bandage must therefore be used.

If we would take off this exostosed Part of the Bone, the Gouge, or exfoliating Trepan is employed. It is applied twice or thrice, as is necessary, and in such a Manner that one Crown may take in Part of the other, in order to disengage the Piece easily.

As to the Rickets, it is proper to remark, that the Parts must always be rejoined according to the Curvature that has supervened, otherwise their Points in Contact, which are very small, would only be reunited, and the rest would be in Danger of remaining void, when the Reunion is effected. But we need not be uneasy; because, when the Rickets are cured, these Bones will recover their natural Rectitude.

If the fractured Bone is also luxated, the Reduction of the Dislocation must be attempted, before the Fracture is replaced, and bound up: It cannot be reduced, when the Fracture is near the Joint, because, there is no Hold to make the Extension, then we reduce the Fracture, and whilst Nature operates to form the Callus, we apply all the Remedies proper to preserve the Suppleness of the Ligaments, and Fluidity of the Synovia of the Joint; and when the Callus is formed, the necessary Extension must be attempted, to reduce the Luxation. I own the Success of it is very doubtful; for it is to be feared that the Anchylosis is effected before the Formation of the Callus: But it is the only Method that can be tried in that Case.

In Respect to the Fracture, three Things render it compound, viz. it's Situation, Figure and Fragments.

As to the two first Articles, I know they are greatly disputed; but without staying to relate all the Reasons, why the eighteen tailed Bandage is preferred to the Circular in these two Cases, I will content myself with adding, that it gives free Liberty to visit the Fracture frequently, without moving the wounded Limb, that it binds it as tight as is necessary to keep it properly

perly reduced ; and never too strictly ; which is very agreeable, as well for the Surgeon as the Patient.

As to the Fragments, the Fracture is not called compound, except in Respect to the Accidents they may occasion to the fractured Limb. Now these Pieces may endanger it, either from their Number, their Distance from the fractured Place, their Points, or in Respect to the Periosteum.

When the Splinters are very numerous, the Fracture must be considered as compound : First, by Reason of the Accidents threatening it, for if there has been so great a Disorder in the hard, how much more in the soft Parts : Secondly, on Account of the Conformation, for it is very difficult to replace them all properly : Thirdly, in Respect to the Cause of the Fracture ; for Example, if it is a Gun Shot, or a Wheel, then the Bone is in a Manner crushed into Pieces, and its whole Substance destroyed : Fourthly, relatively to their Distance. It is good Practice to extract by a Counter Opening the Splinters that are at a great Distance from the Fracture, and intangled in the Flesh ; because they cannot be drawn away through the Wound, nor rejoined, without causing acute Pains ; and lacerating, and dragging the adjoining Parts. Nevertheless they must not be left in, because that would give Reason to dread some considerable Abscess, and sometimes a Mortification ; Lastly, if their Points prick the Tendons and Muscles, or open large Vessels, which are terrible Accidents ; to remedy them, they are to be taken off with a Chisel, or the incisive Pincers, or some other proper Instrument, by dilating, if necessary.

As to the Periosteum, when the Splinters are known to be intirely separated from it, they are to be considered as extraneous Bodies, and consequently as many of them must be extracted as possible, or else we are to have Patience till they fall by the Suppuration, I mean that it is necessary to wait until an Abscess forms where the Splinter is lodged, and the Matter of this Abscess draws it along with it at the first Opening.

On this Head of the Disorder of the fractured Parts, it might be asked, from whence comes it, that in simple Fractures, where the Periosteum and Marrow are lacerated, no Inconvenience happens.

It is necessary to observe that in such a Case, the Extravasation is moderate, that it is in a very deep Place, where the Air cannot penetrate, and where the natural Heat acts in all its Force ; all this occasions the effused Juices to be kept sufficiently fluid, so that a Part mixes with the Fluids, whilst the

other

other transpires. By this Means, all the Obstacles opposing their Reunion, are removed, and no Disorder happens. But, when there has been a violent Contusion, and a very considerable Extravasation betwixt the Bone and Periosteum, and these Humours at the same Time by stagnating begin to ferment, then we are obliged to make an Opening. A Proof, that the Periosteum surrounding the broken Bone suffers, is, that the Pain is continual, and that afterwards the Skin, and other Parts suffer, and inflame. Nevertheless all these Signs are not sufficient to oblige us to lay the Bone bare, something more is necessary to determine us to that, there must be a Kind of Fluctuation to indicate the Necessity.

As the Leg has always been chosen of for an Example of compound Fractures, we will take the Thigh; and suppose an oblique Fracture in the Middle of the Bone, to show the Difference, and Attention, that ought to be used in the Treatment.

The operative Part of compound Fractures.

The Case here is an oblique Fracture towards the Middle of the Thigh.

Although the Complication of the Fracture merely depends upon its Figure, it is not less difficult to treat; since we daily see that the greatest Part of such like Patients are lame, and limp, let what Precautions soever be used.

As such Patients must lay upon their Backs for many Months, and so secured, that the Hip, Thigh, Leg, and Foot be in perfect Repose, Surgeons zealous for their Profession, in Emulation of one another, have search'd all the Means to situate the wounded Part so that the Patient might with Ease go to Stool, and the Operator have the Liberty of dressing, without changing the Situation of the fractured Part.

In this View some order the Mattress to be pierced with a round Hole, where the Buttocks are placed. The Sheet is basted on round the Hole. There is a Stopple of the same Figure, and Thickness of the Mattress, and which exactly fills up the Hole, so that both are perfectly even. This Stopple is covered with a Compress, that serves instead of the Sheet, and it is basted on all round. The Hair Quilt is also pierced with a Hole of the same Diameter. There is besides, a Log of Wood a little larger than the Stopple which it is to support: It must have a Foot to sustain it, that can be easily removed, that the Log may be withdrawn with the less Difficulty.

The

The following Method might be made Use of, instead of the Log. A stopple proper to close the Hole of the Mattress and hair Quilt must be made, and it is to be fixed by a Frame that shuts up the Bottom of the Bed. The Frame may be slit, which will make it the more commodious. This Manner of placing the Patient, and constructing the Bed, is the most easy, because the Hips are not displaced whilst the Patient is attending to his Necessities, which it is otherwise difficult to avoid. When the Patient has Occasion for the Bed Pan, the Log and Stopple are removed; after which both are replaced.

Another Manner of situating the Patient has been invented. There is a Board of a moderate Thickness, only about three or four Inches broader than the wounded Part, and which extends from the Buttocks to the Foot. A Hair Mattress is laid upon this Board, it must be firm, and secured, of the same Length and Breadth, and covered with a Sheet stretched even, and fixed by a Basting. This Mattress serves to support the Thigh and Leg of the fractured Side; the sound Extremity is sustained on two Pillows, one supports the Buttocks, and the other the Thigh, and Leg.

When the Patient would go to Stool, the Pillow under the Buttock is removed, which permits a flat Bed Pan to slide under easily.

Here is still another Method of placing the Patient. A slit Mattress is used, which is cut in a long Square of the same Thickness with the Rest of it. It is covered with a Compress, instead of a Sheet, and fixed by a Basting. The Mattress is also covered with a Sheet, fastened in the same Manner. When the Bed Pan is put under, the divided Portion of the Mattress is withdrawn by two Strings, and after the Patient has been at Stool, it is drawn back again at the opposite Side by Means of two other Strings, and replaced. It is easy to judge that the Patient being thus situated, the Log and Cord make it very easy for him to raise himself during his Necessities.

Three Causes displace the Parts in this Species of Fracture: The Weight of the Body, the Elasticity of the Muscles, and the Motion of the Hips; the great Difficulty therefore is to keep the Pieces well secured, and adjusted; because as they can't be supported against one another, they slip by the least Action of one of these Causes. The Patient being thus situated, the Body falls by its own Weight towards the Bed Foot, which occasions the superior Piece to descend. As for

the inferior, it is displaced, and drawn upwards by the Contraction of the surrounding Muscles.

To prevent the Displacing of the superior Piece, occasioned by the Weight of the Body, a Ligature is used, which embraces the Groin, and being bound to the Head of the Bed, fixes, and sustains the whole Body. To prevent the Displacement of the Inferior, another Ligature is employed, which surrounds the Knee, and is fastened to the Foot of the Bed. Lifts of Serge are used for Ligatures. In this Situation, the upper Part may be thrown out of it's Place by the Contraction of the Glutæi Muscles, and the Hips, or Pelvis may be raised, or depressed. If the sound Hip is raised, the other must be depressed; because the Pelvis is an intire Piece, and by being depressed, it will push the superior Piece of the Fracture downwards: These two Inconveniences must therefore be obviated, which is effected by the Portion of the external Junk, that extends from the Joint of the Thigh to the Middle of the Breast.

It is customary in other Fractures, to confine two Joints only, the superior and inferior; but in this we are obliged to secure the Joints of the Thigh, Leg, Foot, and the Hips, and even to support the Trunk, as has been said.

In order to make the Junks, we take Part of a Sheet doubled, which we roll at both Ends upon a kind of Rod, made of Fir, or Beech Wood. It is to be flat, five or six Lines thick, and about an Inch and a half broad, and it is fastened by some stitches. Laths, such as the Tilers use, may be employed for flat Junks.

The Reason why these Junks are made flat, and not round, as they commonly are for the Leg and Rotula, is, that they may be more firm, and not wound the Parts against which they are applied, or those near them, particularly the internal Condyle of the Arm. The interior Junk is to extend from the Foot to the Groin. The upper Extremity must be notched, and thinner there than elsewhere, for Fear of wounding the Parts. The exterior is to reach from the Sole of the Foot to the middle of the Breast.

It is easy to judge that the same Intentions are to be pursued in the Treatment of these, as in that of simple Fractures.

One of the Napkins, that is to embrace the superior Part of the external Junk, is put under the Back, and the second under the Hips. Both must be laid next the Skin, &c.

After

After which, having ordered the Thigh to be shaved, and washed with warm Wine, We set about the Reduction.

In order to make the Counter Extension, the superior Ligature is used, which is slipped under the Groin of the diseased Side, so that one End may pass forwards, and the other backwards under the Buttocks. This Part of the Ligature is lined with Cotton, and covered with Chamoy Leather, that it may not incommode the Patient. One of the Assistants crosses both Ends a little above the Hips, the one above, and the other below, and they are drawn as much as the Operator judges necessary. But as this Ligature alone cannot make a sufficient Extension, and even none at all, for it only draws the Hip; now we know very well, that the Hip being raised, the superior Part of the Fracture is elevated at the same Time, which Elevation however is but trifling; it is proper therefore to place another Ligature above the Condyles of the Femur, to make the Extension. In using it a soft Compress is applied, which must be well fastened, and secured, because it is to remain a considerable Time above the Condyles. It serves to guard the Thigh from the violent Compression of this Ligature. It is proper to observe here that another is applied above the Malleoli, with the same Precaution, for the Reasons, that shall be mentioned.

The Fracture being reduced, and well adjusted by the Surgeon, an Assistant must hold the upper Part with his Hands; and as the superior Ligature is then useless, it is thrown aside to the other Groin, to be resumed after the Apparatus is placed. Another Assistant is to hold the inferior Part of the Fracture in a just Degree of Extension by Means of the inferior Ligature, whilst the Surgeon applies his Dressings, which is done in the following Manner.

The Part being placed properly, it is laid upon the Middle of the eighteen tailed Bandage, with all the Particulars disposed in the following Manner.

The Tapes to tie the Junks are laid upon the Mattress; then the Junks, and upon them three Pieces of Tape to bind the Paste Boards.

A Sheet rolled up like Junks is put under the Leg to guard it safely, and make it of equal Bulk with the Thigh, that the Junks may press equally above and below. For Want of them Napkins folded double are made Use of.

After which the eighteen tailed Bandage is placed, the longitudinal Compresses, having been first fixed upon the last Rank, which

58 DISEASES OF THE BONES.

which is thicker in the Middle than at the Extremities, to adapt itself to the Curvature of the Thigh.

Upon the last Rank is placed the transverse graduated Compress, and that which is simple and slit at both Ends.

The Rest of the Apparatus consists of Particulars, which may be applied without moving the Thigh; therefore they are set apart; and, as they are nearly similar to those of the simple Fracture, we shall not speak of them.

The Thigh being thus placed upon the Middle of the eighteen tailed Bandage, the Surgeon surrounds the fractured Place with the simple slit compress moistened in a proper Liquor; after which he surrounds the inferior Part of the Thigh with the transverse and graduated Compress. Then he begins by raising the middle Heads of the first Rank, crossing them and carrying the two Extremities towards the superior Part, that they may bind more closely. After which he raises the other two Ranges, beginning with the highest, and so on with the Heads of the second Order.

After having thus raised the Heads of the two first Ranks, he places the longitudinal Compresses, the one upon them, and the other two at the Sides. They are of the same Use as in the simple Fracture, after which he raises the Heads of the third Rank.

In order to secure the Apparatus still better, he applies two Paste-Boards cut in Proportion to the Thickness, and Length of the Thigh. It is proper to observe, that they ought to be notched, especially at the lower End, otherwise they would press upon the Knots of the Ligature: Thus, in binding the Paste-Boards, these Knots would wound.

A very thick Compress is placed under the Ham, that it may be well supported; the whole Apparatus is covered with a Napkin, and the large Junks are rolled. We begin with the internal. An Assistant holds this Junk, whilst the Surgeon fills up the Vacancies betwixt the Thigh, Leg, and it. After which he rolls up the external, and fills up the Spaces in the same Manner. These two Junks are tied together, by four Pieces of Tape, two to the Leg, and two to the Thigh, then he raises the Napkins, that must surround the superior Part of this Junk. He begins with the inferior, which is to descend below the great Trochanters, and surround the Hips. It is of great Use, for it at the same Time confines the great Trochanter, and the Hip of the wounded Side. This Napkin is fastened at the Middle of the Abdomen by a Basting. Other Holes might be made, to give the Liberty of tightening it more or less. After which he raises the other Napkin, which embraces the false
 Ribs;

Ribs; which is a very proper method. Before it is fastened, it is necessary to consider what Situation is most proper for the Patient. Some respire, and sleep in a more supine Posture than others; nevertheless the Head must always be kept in the lowest Attitude possible, and the Buttocks and Legs more raised for the first fifteen Days. The Sides of the Foot are provided with Compresses, or little flat Cushions, made purposely to guard the Malleoli from the Hardness of the Junks, and to secure, and prevent the Foot from inclining more to one Side, than the other, which would displace the Pieces. This Displacement is not immediate; but, the Case is, if the Foot moves, the Leg moves also. It is the same with the Hip, in Respect to the superior Part of the Fracture.

The Heel is supported by the Sponge, Roller, or false Junk, applied under the Leg: Lastly, the Sole with it's Compress is placed, and fixed by two Ribands to the Junks, just as in the simple Fracture.

The Apparatus thus applied; the Ligatures are extended, the superior is replaced, whose anterior End is carried up obliquely forwards, and passed to the opposite Side of the Head; and the posterior along the Back. These two Ends meet behind the Head, and each is fastened apart, either to the Bed-Post, or the Head-Board by two Screws; or for Want of a Head-Board, to a Plank fixed to the two Bed-Posts, or to the Wall with Hooks.

The Ends of the inferior Ligature are passed through Holes in the Board, at the Foot of the Bed, and fastened firmly there, or else the Ligature is kept extended by a Weight. It is proper to observe that whilst the Patient goes to Stool, an Assistant must be ordered to be near him, who, before the Patient moves, is to embrace the Thigh above the Knee, so as to make a Kind of Extension. For Want of an Assistant, some Person is instructed to do the same Operation.

As the Ligatures may at length, by their continual Tension, incommode the Patient, the superior is changed from Time to Time, by passing it under the opposite Groin, or it is sufficient to loosen it for some Hours; whilst the Patient is awake. During which, the Motion of the Body, and Hip must be well guarded against.

The Ligature placed above the Knee is loosened in the same Manner, and that of the Foot is extended; thus they are made Use of alternately.

The Surgeon ought to be careful to visit the Patient frequently, particularly for the first Days, and the principal Thing he should

should attend to, is the Length of the Thigh, examining if it answers to the sound one, and carefully observing if the Body is straight, and, if the Hip, Thigh, and Leg are in the same Plane.

He will judge of the Length of the Thigh, by comparing the Knees. If he perceives it too short, he must not defer undoing the Dressings, and reducing the Pieces by a fresh Operation.

He will know that the Pieces are well reduced, by comparing both Trochanters, and that the Foot is properly situated, if the great Toe answers to the Center of the Rotula.

These are the Precautions that are commonly taken; but they are not sufficient to assure us that the superior Piece may not be displaced by the oblique Situation of the Hips. The Knees, and Heels may be even, whilst the Hip of the diseased Side, being lower than the other, will occasion the superior Part to slip. This Circumstance must be carefully attended to.

After having compared the Knees, and Heels, we find them of the same Length, and though the Patient be straight, his Leg is shorter. In the first Case, it was depressed by extending the wounded Thigh; in the second, it is carried upwards into its ordinary Place by the Elasticity of the Muscles. Hence this Extremity is shorter.

The great Difficulty is to prevent the Rump from being excoriated. In order to relieve it the Stopple is removed, or the cut Portion of the Mattress is withdrawn, to give it the Air for some Hours.

If that does not answer, Mutton Suet dissolved in Brandy with which a Dog's Skin is besmeared, may be placed upon the Stopple with great advantage; or a Cerate is made with Ol. Lin. & Cer. which is spread upon the same Skin.

When it is excoriated, or a Gangrene is feared, Storax mixed with Brandy is spread upon the Linnen that covers the Stopple.

There must be a firm Board at the Foot of the Bed, to which a Log, covered with a little Mattress is fixed, against this the Sole of the sound Foot is supported, for the Uses already mentioned on the Subject of simple Fractures; and here it is of special Service, but the diseased Foot must not press against it; for by this Support the Pieces would override each other.

It has been said that the Board should be pierced for the Conveniency of passing the inferior Ligatures through, and fastening them to it.

OF COMPOUND FRACTURES. 61

It is also a proper Precaution to fix a Cord to the Ceiling of the Chamber, which must pass through the Bed-Testern; or a Cord fastened to two Pins with Eyes is placed transversely to support it. It must fall perpendicularly within the Patient's Reach, that he may be able to take it with his Hands, to raise, and assist himself on different Occasions. It is to be provided with a Piece of Wood across, covered with Linen, to support him better, or else several Knots are made in Gradation, that he may not lose his Hold of it.

If the Thigh of an Infant three or four Years of Age was fractured, the same Apparatus should be used; but to prevent the Urine, and Feces, he might let go, from dirtying him, which would oblige the Surgeon to remove it too frequently, he is covered with an Oil-Cloth.

The Bandage may even be dipt in Oil Amygd. and well squeezed. Instead of Junks, the Thigh, and Leg are included in a grooved Paste-Board. It must be notched at the Side of the Groin, and it's Extremities provided with a Cloth several times doubled, to prevent it from incommoding the Child.

C H A P. IV.

Of the longitudinal Fracture of the large Bones, which is called a Fissure.

BESIDES the simple and compound Fractures, already spoken of, there is still another Kind. It is the longitudinal Fracture of the large Bones of the Extremities.

Many Difficulties have been made concerning the Species of Fracture, called a *Fissure*. To solve them, it has been observed, that it frequently happens to the Bones of the Cranium, Scapulæ, Ossa Iliæ, &c.

The Authors who have treated of the Fracture, by some called a *Fissure*, have confounded it with the oblique. Galen says that we are to have two principal Intentions, in order to a proper Treatment of the *Fissure*; the first is, to replace the Ends of the broken Bone, to which Extension serves: The second is, to keep them in that State by the Bandage, &c.

It is easy to judge that he has mistaken the oblique Fracture for the *Fissure*.

This Fracture commonly happens by the immediate Impression of a hard Body upon the Bone, principally upon those
covered

covered only by the Teguments; for Example by the Kick of a Horse upon the anterior Surface of the Tibia, or a Bullet, which, besides the Depression it may cause in entering into the Substance of the Bone, obliges it to split more or less, according to the Force of the Stroke. It may yet be occasioned by the Point of a Sword, which, in entering, or passing out of the Body of the Bone, forces it to crack, which happens to the Ribs. Falls from on high, and perpendicularly upon the Feet, may likewise produce it.

The most certain Signs of the Fissure, when it is without a Wound, are a dull, fixed, and continual Pain, which is more or less exquisite in Proportion to the Fissure, and which increases when pressed upon with the Hand. If it is in the Tibia, it is difficult to move the Leg, and the Pain increases. But the Difficulty of moving the Part may also proceed from the violent Contusion of the Periosteum, and the Liquors extravasated betwixt it and the Bone. In that Case, by being pressed upon, a very acute Pain is felt, which is owing to the Tension of the Periosteum. All these Symptoms therefore are not convincing Proofs of the Fissure, since they may be produced by some other Cause.

When there is a Wound, the Fissure may be discovered by the Finger, or Probe, and sometimes by the Sight, if the Wound, and Fissure are large enough.

Of simple Fractures, the Fissure is the most dangerous, when it is accompanied with Symptoms, as very acute Shooting Pains. It is exposed to Abscesses succeeded by fistulous Ulcers, and sometimes by a Putrefaction of the Marrow, and a continual Fever with Paroxysms. Most of these Symptoms are owing to the Extravasation, and Putrefaction of the Juices oozing from the Vessels of the Marrow, and contused Periosteum. When a Tumor forms upon the Fissure, it is owing to the Collection, and Mixture of these same Juices, which at first produce an Oedema in the Part, and then an Inflammation; and as they sometimes insinuate by this Aperture to the Canal of the Marrow, it very soon spoils, and corrupts; the Substance of the Bone becomes gradually as it were spongy, and sometimes it swells, and exostoses; and after the Patient has suffered great Pains, an Ulcer with fungous Lips appears upon the Leg, which are very troublesome; for, although they be taken off, either by Medicaments, or even by the actual Caustery, they push out again with the same Force. In that Case, Amputation is the only Remedy.

But

But if we would prevent it, the whole Length of the Fissure must be laid bare. Some-times the Trepan is applied, to give Issue to the purulent Matter confined in the Canal of the Marrow, and Texture of the Bone. Sometimes the Tumor only forms below where the Bone is crackt, which is effected in this Manner. The Fissure occasions the nutritive Juices to extravasate, and flow betwixt the Bone and Periosteum, which being attached to the Bone by an infinite Number of small Vessels, that only separate from it gradually, obliges them to lodge there for some Time. These Juices by their Stay become acrid, and corrosive, and in Proportion as they erode, and lacerate those Vessels, they make themselves a Passage towards the Joint, or their own Weight draws them along, and as they find more Resistance there; because the Joint is more closely enveloped, as well by the Ligaments, as Tendons, they accumulate betwixt the Periosteum and adjoining Parts, and there produce an Abscess.

If the Fissure is with a Wound, those bad Juices make it degenerate into a very obstinate Ulcer, which suppurates by little and little, and cannot be cured without uncovering the Bone, and making it exfoliate.

As it is difficult to discover whether there is a Fissure or no, nothing must be neglected that may help to assure us of it. The precise Place where the Pain is must be searched with the Fingers, and examined, whether any Thing is split, and uneven. It must be asked, if the Patient has been flung with Violence, and unexpectedly against a Stone, or any other hard Body, or if he has fallen from on high, and perpendicularly upon his Feet, &c. His Constitution and Age, and the Nature of the Pus must moreover be considered. The Bones of People of a dry Habit, and those with a venereal Virus, are the most disposed to split. If the Pus is too thin, of a greyish Colour, of an urinous Smell, if it blackens the Linen, we may then suspect the Bone to be carious.

The principal Care at first must be to order the Patient to be kept very quiet, and apply the most powerful Resolvents, to make the Juices collected about the wounded Part transpire. Every Thing proper to prevent the Putrefaction of the Juices are to be mixed therewith; for Example, Ol. Palm. — Laur. — Lumbri-cor. — Succin. distil. — Junip. — Sassafr. vel — Terebinth. and they must be sharpened with Sp. Sal. Ammoniac. If these are not sufficient, the most sure Method is to lay the Fissure bare, and follow it's Course; then the exfoliating Trepan is applied in it's whole Extent, and it is scraped with the Rugeine to the sound Part of the Bone, or to the Marrow, if necessary.

necessary. Balsam. Arcæi is made Use of to produce a Régénération of Flesh; and it is sometimes cured without any sensible Exfoliation; especially if it be quickly remedied. If there is a Tumor below the Joint, and after it is opened a Sinus is found, it is to be followed in order to a Discovery of it's Source, viz. to the Place where the Bone is fissured, and it is treated as afore-mentioned.

I am not of Opinion that the above-mentioned Tumors should be opened before their Maturity; for, as they frequently proceed from some other Cause than the Fissure, it is first necessary to try to resolve them.

Some have pretended that a Bandage might be used to bring the Edges of the Fissure together again, and prevent the Extravasation of the nutritive Juices, which, being thus retained, will serve to re-unite it. But that can never happen, except when the Patient keeps himself very calm, and then he owes his Cure to the Repose, and not to the Bandage; for however tight it be, if the Person moves, the Matter will nevertheless flow betwixt the Bone and Periosteum, and produce the same Accidents as if there was no Bandage. Besides, it will increase the Inflammation of the Periosteum, and produce still more troublesome Symptoms.

Before we offer Observations of the Possibility of the longitudinal Fracture, as is just now proved, we will relate the Opinion of those who have denied it, and the Reasons they have alledged. A celebrated Surgeon of his Time explains himself thus.

“ After having consulted the most famous of the Profession, and read such Authors as Hippocrates, Galen, Fabricius ab Aquapendente, Guy de Chauliac, I have found, that they have all spoken in a very doubtful and obscure Manner, and confounded the Fissure with the oblique Fracture. Galen, and all Writers since him, have said, that two Intentions are requisite to treat the Fissure properly: First, to replace the Ends of the broken Bone, and to which Extension serves; Secondly, to secure them in that Situation by the Bandage, which must be more tightly bound than in the other Fractures.

“ Fabricius ab Aquapendente, in his Treatise of Fractures, in the Chapter of the Generation of the Callus, says, that the same Method must be employed in treating the longitudinal Fracture, as the transverse, except that the Bandage is to be more strictly bound, *alias enim facile posset decidere*; otherwise the Pieces would easily separate, according to Ga-

len's

“Ien’s Remark in the fifth of the Method.” Guy de Chauliac has only copied Fabricius.

It is easy to perceive that Galen, and those of his Opinion, have mistaken the oblique Fracture for the Fissure; for, supposing it could happen, Extension would not be necessary, since the Pieces are not displaced. The Bandage would still be less so; for, however tight it might be, it would never bring the Edges of the Fissure together again. It is true, these two Intentions perfectly suit the oblique Fracture, because the Ends of the fractured Bone being aslope, slip, and easily mount upon each other, and this is the Reason why Extension, and Counter-Extension are requisite; and the Band must also be more tightly bound to compress the Pieces well, and keep them reduced.

They all agree, that the Fissure is very difficult to be found out, and that the most certain Signs, when it is without a Wound, are a fixed and continual Pain, which increases by Pressure, or when the wounded Part is rested upon.

But who does not perceive that all these Accidents are only the Consequence of a violent Contusion of the Periosteum? As for the Tumor said to be formed upon the Fissure by the Extravasation of the nutritive Juices of the Bone, it is easy to judge that it is occasioned by the Effusion of the Juices betwixt the Bone and the Periosteum.

Lastly, let us suppose that there was a simple Fissure in the Bone, it would re-unite of itself by the Juices ouzing from the Vessels of the Periosteum, and the chief Care of the Surgeon would be to keep his Patient very quiet, and to use the most powerful Resolvents.

It is agreed that Bones may split; Musket-Balls, for Example, shiver, and split them; the Stroke of a Hammer, or Kick of a Horse, will occasion the same Disorder. But all these Examples do not ascertain that Species of Fracture, which we call Fissure, or simple Crack; these are Species which ought to be ranked in the Class of Fractures with Shivers, Contusions, Depressions with Fissure; lastly, Incisions, and every Thing proposed for the Fissure, are quite contrary here.

This Opinion, contrary to Experience and Practice, made a Surgeon in Paris, very famous in his Time, the Victim of a longitudinal Fracture of the Tibia, as the Disease was not known ’till a little before the Patient’s Death.

That Observations deserve more to be regarded than the most specious Reasonings, is the Answer I shall make to the above related Objections. We will add three Cases to that of the above-mentioned Surgeon.

OBSERVATION I.

A Priest mounting a Ladder to take a Book from his Library, fell about twelve Feet high, and violently hurt the Middle of his left Leg. A Tumor formed along the anterior Part of the Leg, with Ecchymosis. The Pain was very acute. Bleedings, and topical Applications concurred to quiet the Pain, and diminish the Ecchymosis, and Tumor. Some Days after the Patient thought himself cured, and acted accordingly. Going to Bed, he perceived a Redness at the anterior Part of that Leg, with a little Tension. He was seized in the Night with an insupportable Pain. It was determined to make an Incision upon the most elevated Place, that should penetrate to the Bone. A sanious Serum was discharged, which appeared to have been lodged betwixt the Periosteum, and Bone. The Periosteum was separated more than two Fingers Breadth. It was not difficult to know from whence these Symptoms proceeded, as a very extensive Fissure appeared. The Incision was obliged to be lengthened at the Angles. The Patient was greatly relieved. To quicken his Cure, and prevent the Symptoms, to be dreaded in these Sort of Disorders, Recourse was had to the perforating, and exfoliating Trepan, which succeeded, as the Fissure did not penetrate to the Canal of the Marrow. The Patient was cured within two Months.

OBSERVATION II.

A Young Man, fifteen or sixteen Years of Age, had his left Leg fractured by a Cart-Wheel, towards it's inferior Part, with a Wound. The Fracture was reduced, and the eighteen tailed Bandage applied. He did not complain during the Treatment. When he began to support himself upon his Leg, he felt a dull Pain at the anterior Part, a little above the Fracture, which increased gradually, and a black Spot appeared. Upon the Touch a Fluctuation was felt, and an Incision was immediately made to the Bone. Pus, and afterwards a black Matter discharged from it. After the Wound was cleaned, the Periosteum was found putrefied, and a slight Fissure discovered, the Exfoliation was procured, and the Patient was soon cured.

OBSERVATION III.

ONE of the Guards riding on Horse-back with several of his Fellow-Soldiers, received a Kick from his Neighbour's Horse, towards the Middle of the Leg. Although he was booted, he instantly felt a very violent, and acute Pain, which went off insensibly, but his Leg remained benumbed, so that he could not move it. Being got Home, he was obliged to go to Bed. The Surgeon who saw him remarked, that the Stroke had made a great Impression in the Skin, without changing it's Colour. He applied proper Topicks. Twenty-four Hours after the Patient complained of great Heat at the Circumference of the struck Place; and the Skin became dry, of a Citron Colour, very hard, and insensible. As it no longer enjoyed Life, it was taken off as a dry Gangrene, and he was cured in a little Time.

Three Months after, being upon Guard with the King, he was seized with a pungent Pain, which prevented his Exercise. He returned to Paris to be treated, after having unsuccessfully tried different Topicks, he went to the Charité. A Monk, who then practised Surgery there, after having tried different Remedies, proposed to him to make an Incision to the Seat of the Pain, suspecting the Bone exostosed. This made the Patient very uneasy, but he submitted to it upon Account of the Torments he endured. The Incision being made, the Bone appeared of a brownish Colour, a little elevated, with a very plain, long, and deep Fissure. The Wound was lengthened upwards and downwards, and dressed dry; he was calm, and slept. At the Removal of the first Dressing, the Disease clearly shewed itself. The Gouge and Hammer were immediately employed to take off the elevated Part of the Bone, which was repeated a second Time upon Account of certain Pains the Patient said he felt in the Body of the Bone. At the last Strokes, a yellowish and very stinking Liquor issued out from the Bottom of the Fissure, which relieved him. At the following Dressing three Crowns of the Trepan were applied upon the Crista of the Tibia, close to one another, the Bridges were removed, and the Marrow was found absceded. The Patient was treated with great Care, and Attention. Some had advised Amputation, nevertheless the Preservation of the Limb was aimed at, and he was perfectly cured at the End of four Months, or thereabouts.

C H A P. V.

Of the Fracture of the Bones of the Head.

I SHALL not speak here of the Fracture of the Bones of the Cranium; I refer that Subject to my Course of Operations of Surgery. I will confine myself to the Fractures of the Nose, the Zygomatic Process, and lower Jaw.

ARTICLE I.

Of the Fracture of the Bones of the Nose.

THE Nose is composed of two Bones. They are placed at the superior Part of the nasal Cavities, of which they make the external covering. They are convex externally, and slightly hollowed internally. They vary in Length in both Sexes. Their Connexion with the frontal Bone, the nasal Process of the Os Maxillare superior, and perpendicular Plate of the Ethmoid, supports them. They are likewise joined together.

The Fractures of these Bones are sometimes attended with bad Consequences. Sometimes only one is fractured, but most frequently both, especially when a Blow is given perpendicularly. A transverse Stroke may depress them, or only fracture the Extremity by which holds the first Cartilage serving to form the Nostrils. Falls produce the same Effect as Blows.

If both Bones are fractured, near the Root of the Nose, it is very reasonable to suppose that the perpendicular Plate of the Ethmoid is broken; that is known by introducing the little Finger into each Nostril, because this Plate may be thrown more to one Side, than the other. There is nevertheless one Thing to be observed, that, in many People this Partition, or bony Plate, doth not preserve it's perpendicular Direction, but inclines more to one Side than the other; concerning which the Patient must be asked, to prevent a Mistake, and also save the Part the Fatigue it must undergo in the Endeavour to rectify it; which could not be done without fracturing it, and increasing the Symptoms; when only one Bone is broken, there is less to be feared.

Those Bones may be fractured transversely, obliquely, and in different Ways. These Fractures frequently happen without the

the Displacement of the Pieces. They are discovered by introducing the little Finger of one Hand into the Nostril; whilst the Fingers of the other Hand press slightly from without inwards. This is the Way to ascertain the fractured Place. If the Pieces are displaced, it is always rather inwards than outwards; and even these Fractures are almost always attended with Wounds more or less extensive, particularly when the Plate of the Ethmoid is likewise broken. External Wounds being very frequent, the whole Extent of the Nose is often very much swelled, and distended, with an Ecchymosis, that renders the Fracture very difficult to be found out.

The Complication of external or internal Wounds is not to be overlooked. Indeed the internal Membrane of the Nose instantly inflames notwithstanding the Loss of Blood; the Respiration is interrupted, an Ecchymosis appears, which is greatly against the Treatment.

The Hemorrhage is to be feared, since People have been seen to fall into Synopes, with Loss of Sense, especially when it is owing to the Rupture of some arterial Branches. That of the Veins is nevertheless considerable, by Reason of their great Number that beset the internal Membrane.

The Signs to assure us of the Fracture of the Nasal Bones are not always certain; for there is no other Method than this already mentioned, which is to introduce the little Finger into the Nostril, and thereby examine it; but the sudden Swelling both of the external and internal Parts, opposes it. The Fractures are more easily discovered in those, whose Noses are large and long, and who are not very fat.

Noses depressed at their upper Part, and whose opposite End is raised up, which are called flat Noses, make the Fractures of difficult Discovery; and on the contrary they are very conspicuous when we are called at the Instant of the Blow, or Fall, the Symptoms not yet appearing.

Blows or Falls that do not fracture the nasal Bones, and whose Force bears upon their Junction with the Frontal, are very bad on Account of the Shock communicated both to the Dura Mater, and Substance of the Brain; which may be treated as a Concussion.

The Symptoms are almost as different as the Blows, or Falls can be. Some feel violent and acute Pains in the Membranes, which are frequently periodical. Others have a Kind of Vertigo. Lastly, some complain daily of a Bar above the Eye Lids. That can only be owing to the Inflammation, or Obstruction, of the Membrane lining the frontal Sinuses. It may be added that the Inflammation of these, and

the neighbouring Parts causes frequent Bleedings of the Nose, and several other Symptoms, &c.

The Symptoms appearing some Time after Blows or Falls, succeeded by Fractures, generally manifest themselves by Abscesses, or Collections of Matter in the internal Membrane of the Nose, and even shew themselves externally. These Abscesses require particular Attention; for, as the pituitary Membrane is beset with a great Number of Glands, that may occasion Vegetations, or Excrescences, called Polypusses, which, for Want of Treatment, become cancerous; or else the Abscesses degenerate into an Ozena; which causes an intolerable Stench, that entirely destroys the Organ of Smelling; or, if any remains, it is imperfect, and even makes the Patient uneasy. The Voice also changes, and the Patient is displeased with himself. Besides all these Inconveniencies, the Ductus ad Nasum may be obstructed, which may occasion a Fistula Lachrymalis. In Fractures the Concussion is dangerous, as it may cause Abscesses, or Fungus's, as has been observed in Subjects opened after Death.

The Prognostic of the Fractures of the nasal Bones can only be drawn from examining the Symptoms that commonly attend, and those that supervene; notwithstanding all the Care employed in their Treatment. It is known that, if the Fracture is simple, it is trifling; but it is not the same with the compound. Ulcers are also to be dreaded. If the Fracture has caused a Fistula Lachrymalis, it ought to be considered as very bad, and even incurable.

OBSERVATION.

A Woman about forty Years of Age, was struck upon the right Side of the Nose. The Nose and Eye swelled monstrously, attended with Contusion, and Ecchymosis, which would not let one judge whether there was a Fracture or not. The Hemorrhage from the Nose was excessive. The Oppression she was then under stopped her Menses, which she at that Time had. The internal Membrane of the Nose became so large by the Inflammation, that it produced a Tumor that filled up the whole Entrance of the Nostril. The Respiration was totally intercepted on that Side. She was bled several times at the Arm, and Foot. After fifteen Days Dressing a Tumor with Fluctuation was perceived near the great Angle. It was opened, and dissolved, and very stinking Blood discharged. The nasal Bone was found bare and a small Portion separated from the Cartilage was removed. The Patient being almost cured,

cured, was seized with a Fistula Lachrymalis, which afterwards hindered her from having a Moment's Ease. She was advised to go to Mr. Woolhouse, Oculist, who persuaded her to the Operation. Some Days after a Fungus rose, which could not be destroyed; the Disease degenerated into a Cancer, and the Patient ended her Days in cruel Pains.

The Treatment of the Fractures of the Nose is the most simple, when we are certain of the fractured Place; if it is simple, that is, of one Bone only; or even compound, when both are broken. The Depression that may happen to them must also be attended to.

If the Fracture is particularly with an internal Wound, Care must be taken during the Reduction of the Bones not to put the Instrument into that Wound.

In order to the Reduction of those Bones, whether they be fractured, or depressed, the Patient is ordered to sit upon a Chair without a Back, his Head reclined, and supported by an Assistant. If the Person is young, the Hands are held, that the Operator may not be interrupted. To raise the depressed Pieces, Recourse is had to the Handle of a Spatula, or a Piece of Wood of a proportionable Size; which must be covered with a Bit of Rag. These small Instruments ought to be preferred to the little Finger, which by it's Largeness may lacerate, or contuse the Membrane. The Introduction is from below upwards to above the Fracture, and, by pushing from within outwards, the Piece is raised. The depressed Place is embraced by the Thumb, and Fore-Finger of the other Hand, to contain, and replace them. It is frequently necessary to perform the same Operation on the other Nostril, to elevate the displaced Piece. This Reduction is not the most difficult, and there is no need of Dressings to keep the Pieces in their Places. It is sufficient only to introduce a Dozel of soft Lint wet in a Defensive, into each Nostril; not to contain the Pieces, but to diminish the Tension of the Membrane, and prevent the Symptoms. The present Practitioners have quitted as useles, Quills, Lead Canulas, and Sponges, which Authors recommend. Compresses wet in Brandy are applied upon the external Part of the Nose, and the whole is supported by the Sling-Bandage, or Handkerchief. If there is a Wound, it must be dressed as practised elsewhere. The Patient is to be bled according to his Strength, and Symptoms, and a proper Regimen prescribed him, which he is to observe.

ARTICLE II.

Of the Fracture of the Zygomatic Process.

THE Zygomatic Process belongs to the Os Temporis. It rises a little above the Mearus auditorius externus, and continuing it's Course transversely from behind forwards, it goes to join the posterior Angle of the Os Malæ. It forms an Arch, under which the coronoid Process of the lower Jaw is lodged, and covers the Temporal Muscle, which is attached to that Process. This Arch is connected with the above-mentioned Muscle, both by a strong Aponeurosis and fleshy Portions.

The Causes of the Fracture of this Process are the same as all others. It may like them be simple or compound. The Pieces are commonly depressed inwards. The Situation shows that it must be so. One Portion may notwithstanding be thrown outwards, whilst the other remains in it's proper Situation.

It's characteristic Signs are; first, the Patient can with Difficulty open the lower Jaw; secondly, he feels a very violent Pain at the fractured Place, with Tension of the Temporal Muscle; thirdly, he is attacked with slight Convulsions, owing to the Compression of the nervous Filaments of the Portio dura.

The Accidents and Prognostic threaten no Danger, the only Business is to reduce it. As there is scarce an Author who mentions it; I will relate what I have done on this Occasion.

OBSERVATION I.

A Soldier of the French Guards received a Blow from the End of a Stick. The whole Cheek swelled. He had great Difficulty in moving the lower Jaw upwards and downwards. I examined the Zygomatic Process, and felt a Depression under my Fingers. I introduced the Fore-Finger of my left Hand into his Mouth; I carried it beyond the first Dentes molares, the furthest I could, pushing with it from within outwards, and I felt the Process fractured, and depressed. As I could neither raise, nor force, the Pieces outwards with my Fingers, or other Instruments, I advised the Patient to take a Piece of Wood a little flattened, of the Size of a Finger, and put it upon the last Dentes molares, and close the Jaw to the utmost of his Power; after he had performed this Operation for some Hours, he was relieved; he continued,

nued, increasing the Size of the little Stick, and thus the Pieces were replaced by the mere Contraction of the crotaphite Muscle; which forced the Process from within outwards. To diminish the Contusion, a Compress wet in Brandy was applied, sustained, and fastened to his Night-cap.

OBSERVATION II.

A Child three or four Years of Age, played with a Kind of Spindle for Bone-Lace, which terminated by a little Button in Form of an Olive, whilst it had this End in it's Mouth, being upon the Steps of a Stair-case, he fell Head foremost. The Resistance of the opposite Extremity of the Spindle occasioned the Button to enter, which pierced the internal Membrane of the Cheek to the Zygomatic Process and fractured it from within outwards. The Button broke off in the Wound, which was not attended to. A great Inflammation, and Tension seized upon the Cheek. Those who first saw him discovered nothing; he was dressed near a Month unsuccessfully. He could take no other Aliment but Fluids. The Wound continued always, the Lips were a little callous, a bloody Serum discharged from Time to Time; I was called in, and I inquired how it happened. I perceived the Patient could not open his Mouth. I introduced my Finger, and felt the Wound, and advancing towards the Zygomatic Process; the End of my Finger was stopt by the extraneous Body. I forced a little, and with the other Hand, applied upon the external Part of the Cheek, I discovered the extraneous Body by it's Resistance. I advised the Parents to apply a Cataplasm of Milk, Bread, Eggs, and Saffron, upon the Cheek. I ordered Wine mixed with Honey to be injected into this little Ulcer for three or four Days; and the Parts became relaxed. When I was still better assured of the Situation of the extraneous Body, I ordered the Child to be placed upon a Man's Lap, who kept it's Head reclined, and firm. I introduced the Ring-Forceps, and extracted the Button. That done, I applied the Palm of my Hand upon the Cheek, pressing it a little, and replaced the Zygomatic Process. Proper Injections were employed for some Days, and the Child was cured.

I might relate Examples of Fractures of the Os Malæ, and Maxillary Bones; but the most frequent are occasioned by Gun-Shot. I refer the Readers to those who have wrote upon that Subject.

ARTICLE III.

Of the Fracture of the lower Jaw.

THE larger Surface a Bone has, the more liable is it to be fractured; this is remarked in the lower Jaw. On what Side soever it's Surfaces are viewed, there is not one to be seen that can be secure against Fracture. It's anterior Part, or the Chin, projects outwards. It's Sides, which retain the Name of Basis, are flat, and terminate the Cheeks. Each finishes by an Angle, from whence rises a bony Production, that divides into two Eminences; the posterior is furnished with a transverse Head, called Condyle, the anterior ends in a Point, to which the Name of Coronoid Process is given. It is lodged under the Arch of the Zygomatic Process, to receive the Tendon of the Temporal Muscle.

The Jaw is greatly hollowed; it's Sides diverge to form the inferior Part of the Mouth. It contains the Tongue, and other Parts. It's Articulation is double. It's Condyles are received into the Cavities of the Temporal Bones. Betwixt each Condyle, and Cavity, is an intermediate Cartilage, that facilitates it's Motions. It's Structure is compact, solid, and capable on certain Occasions of resisting external Impressions. Besides, the Mobility of it's double Articulation, and the Sockets, which it is provided with to a certain Age to contain the Teeth, may in some Sort deaden the Effort made upon it, by dividing the Action and Violence of the Blow, or Fall, as the Diploe does in Respect to several Bones of the Cranium.

The Jaw may be fractured in it's posterior Part near it's Angles, or in some Part of it's Basis, or towards the Chin; Blows, or Falls make the Difference of Fractures. They may be transverse, oblique, longitudinal, or perpendicular, with or without Splinters, and Wound.

The Fracture near the Angles is the most dangerous, on Account of the Tendons, and Aponeuroses, situated there, and the Vessels and Nerves passing into the bony Canal of the Jaw.

If it is fractured at it's Basis, it is with, or without Displacement. The Piece respecting the Angles does not displace, because it is supported by the Muscles attached to it. That respecting the Chin descends by it's own Weight, and by the Action of the Depressor Muscles of the Jaw.

If the Pieces are not displaced, the Chin is only to be supported; but if they are, the Process is quite different.

The Signs indicating a Fracture of the Jaw, are obvious to the Sight, and Touch. It is seen when the Mouth is awry, when the Teeth are displaced, and have quitted their Sockets, and when they are no longer opposite to those of the superior Jaw. The Deformity, or Displacing of the Pieces, is also a very evident Sign; but the Lips may be drawn to one Side by a convulsive Motion, or frequently by a Paralysis without a Fracture; it is therefore an equivocal Sign, and merits Attention. It is not improper to observe that, when the Lips are drawn aside in Consequence of a Paralysis; most of those called to treat this Disease, apply Topics upon the Place turned awry, instead of that whose Muscles have lost their Spring; now the Muscles of one Side cannot be relaxed, but those of the opposite Side must draw both Lips by their Contractions. I thought I ought to make this Reflection, to undeceive a Number of People, who fall into this Mistake for Want of knowing the Use of the Parts.

If the Fracture is succeeded by an Inflammation, it can only be discovered by the Touch; by introducing the Fingers within the Mouth, and examining the external Part at the same Time; whereby the Displacement of the separated Pieces is positively ascertained.

The Fracture without displacing, when perpendicular, requires the Fingers to be introduced into the Mouth; and by keeping them equally upon the external Part at some Distance from one another; different Motions are made contrary to one another, that the Crepitation may be heard.

The Prognostic of Fractures of the lower Jaw is only dangerous with respect to the Degrees of Complication, or bad Treatment. Every simple Fracture is easily cured. That with a Wound, and Splinters, requires particular Attention, especially if it is above the Angles.

The Symptoms of these Wounds, are convulsive Motions; the Palsy, which is frequently occasioned by the Compression, or the too great Tension of the large Nerve, that passes into the Canal of the Jaw; hence the Circulation is interrupted, and produces a Swelling, that hides the Disease. Lastly, the Ankylosis of the Joint is the most terrible Accident. The great Tension of the Nerve, by it's Communications with the Portio dura, causes a Numbness of those Parts, as also a Tingling within the Ear. These Symptoms go off afterwards.

It happens in an infinite Number of Cases, that the Teeth are injured, although they be more solid, and compact than the other Bones of the human Body. It is then necessary to extract them,

them, to prevent a Crowd of Symptoms, and intolerable Pains. A Fracture then becomes very serious. In an advanced Age the Teeth of both Jaws fall out, *which is occasioned by the Constitution, or a local Faultiness.* If the inferior Jaw is entirely emptied, the Sockets close insensibly, without leaving the least Trace of their Cavity; the Gums compress them, the Sockets and Gums harden gradually; from whence results a Chisel-like Edge capable of breaking hard Bodies; the Jaw diminishes; it's anterior Part projects further out than the superior. When it is closed, it is carried to the Nose. A Fracture in this Case requires other Precautions, than those commonly used; the Jaw is to be secured by Compresses, and a PASTE-BOARD which moulds to it's Figure; it must not be brought too near the superior. The proper Bandage is the Sling, and a Compress for the Chin.

The Reduction of the Fracture of the lower Jaw is not to be undertaken, 'till it's Species be known; the necessary Means to find it out must therefore be employed. The Fracture without Displacement requires a contentive Bandage only. That where one of the Pieces has quitted it's natural Situation may be higher than the other, and consequently it's Teeth will rise above those that are in their ordinary Level; by sliding the Thumb along the Basis, an Unevenness will be felt. If the displaced Piece is pushed inwards, the other passes above, and serves it as a Supporter: In this Case, there will be an Eminence on one Side, and a Depressiion on the other, as well externally, as internally. The following Particulars must be attended to, to save the Patient the Pain of a second Operation in these two Species of Fractures.

The first is reduced by introducing both Thumbs into the Mouth on the fractured Side, with the other Fingers the whole Jaw is supported. Two different Motions are then to be made; the first is with the Thumb, which bearing upon the elevated Piece, must press it from above downwards to bring it back. The second is made with the Fingers of the other Hand, which must be under the Chin, and are to push the other Portion from below upwards.

A Fracture rarely happens without some Inequalities; which obliges the Surgeon in these Motions to pull the Pieces sideways, to facilitate the Reduction, and replace them.

When, in the Fracture of the Jaw, as afore-mentioned one Piece is thrown inwards, and the other outwards; the same Operation as just described must be performed, which is to place the Thumbs in the Mouth, and the Fingers under the Chin. Then the Patient being held firm, it

is necessary to make Motions contrary to those practised in the first Kind; to wit, Extension, and Counter-Extension are to be performed upon the Sides, to free the Pieces engaged upon each other.

The Bandage is the same. If the Patient's Teeth are injured, then by Way of Security against Wounds, the Fingers are wrapped with a small Band.

These Fractures sometimes have Splinters, which either push inwards, or outwards. This must be attended to, as it is necessary to replace them.

The Reduction being made, Authors recommend the Bandage called Capistrum; but the Sling, and Compress for the Chin are preferable. We are to remember likewise, not to bring the inferior Jaw close to the superior, so as to serve it as a Splint. That would be hurtful to the Patient, as he could not take liquid Aliments to nourish him. He is to keep quiet, and not speak for some Time, for Fear of displacing the Pieces. He must also avoid laying upon the Fracture.

As for the Displacement of the Teeth, if they have quitted their Sockets, they may be replaced; Experience having shewn, that they fasten again. Those that are loose may likewise be tied to those that are sound; but this Operation is not necessary.

Besides the forementioned Fractures, there are some attended with larger or smaller Wounds, either externally, or internally. When the Complication is occasioned by Gun-Shot; it is always more terrible, by Reason of the Putrefaction, and great Suppuration, which follow it, than that by a Fall, or a bruizing Body.

When the Wound is within the Mouth, it must be treated and dressed twice a Day, in order to prevent the Stay of the Saliva which might cause Accidents. To prevent them, and hinder the little Dozels, or Pledgets with which the Wound is dressed, from being penetrated, little Pieces of thin Sponge are introduced to absorb the Saliva; and they are changed from Time to Time.

If the Wound is with Loss of Substance of the soft Parts, and the Bone be bare, it commonly requires Exfoliation. It is necessary therefore to endeavour to hasten it, under a due Attention to the Solidity of the Jaw; nevertheless when a Portion of the Jaw is uncovered, and the Wound is recent, although contused, it must be reunited, in order to guard the Bone from the Air, and facilitate a slight Suppuration. The Bandage is the same as in other Fractures. Some recommend

a Plate

a Plate of Tin with an Aperture opposite to the Wound, for the Sake of dressing it more easily.

Although this is not the Place to speak of Fractures from an internal Cause, I will notwithstanding relate an Example, which may be placed amongst the Diseases that attack this Part.

OBSERVATION.

A Woman about forty or fifty Years of Age was obliged to be salivated. A Wound, or rather an Ulcer formed in the Gum, on one Side of the Jaw. The Surgeon who had the Care of it, perceived a Portion of this Bone bare. It afterwards appeared separated from the sound, which induced him to enlarge the Opening of the Gum, from whence he extracted one half of the Jaw. Thanks to his Care in the Dressings; that Woman had no Deformity remaining, since to the Eye the Chin preserved it's ordinary Roundness.

CHAP. VI.

Of the Fractures of the Trunk.

ARTICLE I.

Of the Fractures of the Clavicle.

THE Structure of the Clavicle is not very different from that of the Ribs, the bony Fibres of it's external Surface are twisted, viz. they follow the Direction of it's Figure. They are compact, and solid; but quite spongy internally. They resist and support very considerable Loads; this is daily seen in the Work of Brewers, Carpenters, Mariners, and others, &c.

The Clavicle is frequently exposed to the Danger of Fracture. First, a Stroke given perpendicularly in it's Middle, as it lies hollow, must fracture it transversely, obliquely, or with Points. It's horizontal and oblique Situation from before backwards subjects it to this Accident, it being only supported at it's Extremities. Secondly, it projects more or less in both Sexes, but commonly more in Women. It is less apparent in fat People, especially in those with a short Neck. Thirdly, it's convex Part is only covered by the Teguments.

It nevertheless gives Attachment to strong Muscles, at it's anterior external Edge to the Pectoralis major; backwards to a Portion of the Deltoid; at a little Distance from the Sternum to one Head of the Sterno Mastoideus, posteriorly to the Cucullaris.

It's Figure is represented by that of a Roman S reverfed, convex externally, and concave internally. This Space is occupied by a Muscle called Subclavius, which binds it's anterior Part by a strong and short Tendon to the first Rib. This Rib serves it as a Point of Support, especially in the Adult, whose Cartilage soon ossifies. Fourthly, Falls either forwards, or side-ways, or when the Arm is at a Distance, and separated from the Breast, when the Weight of the Body overcomes it, are the Causes of Fractures.

The Clavicle has an anterior and posterior Extremity. The anterior is articulated by Arthrodia with the first Bone of the Sternum, and, to render it's Motion more free, it is embraced with an intermediate Cartilage. Although only Part of it's Head be received into the Cavity of the Sternum, it starts out but seldom, except by a very violent Shock. It is surrounded with strong Ligaments, that are peculiar to it, which resist all it's Motions; wherefore there is no Luxation to be feared, and, if it happens, it must be occasioned by a considerable Fall, as I have observed it in the Body of a Girl sixteen Years of Age, where I found it separated from it's Periosteum, and all it's Ligaments lacerated. It was carried towards the Larynx.

The opposite or posterior Extremity of the Clavicle is round, flat, and closely attached to the Acromion by Ligaments, which allow it a little Motion. It is likewise bound to the coracoid Process by Ligaments. It's Union, or Articulation with the Acromion is effected by a little polished Surface, which answers to a similar one of the same Bone. Some have thought that it might luxate; but that is as difficult here, as in the Case of the anterior Part, and perhaps it never happened, and what has been taken for a Luxation, was only a Fracture of the Extremity of the Clavicle, or Acromion, or lastly of both at the same Time.

This Fracture is more frequent than is imagined. Indeed it is difficult to be found out, unless we be well versed in the Practice, and Knowledge of the Structure of the Parts. Frequently the Plumpness, a violent Contusion, an Ecchymosis, manifest these Fractures; and besides they are not exposed to a Displacing.

There are few Fractures, where the Pieces are so subject to a Displacement, as those happening in the Body of the Clavicle. The Actions of the Muscles have a great Share in a Displacing breadthwise; for, exclusively of the Blow, Fall, and Weight of the Arm which drags the Shoulders downwards, and consequently the Portion of the Clavicle joined to it, it is certain that this Portion is drawn in the same Direction by the pectoral and deltoid Muscles, because they have no longer a Support from the Clavicle, upon Account of the Fracture. This Portion of the Clavicle being become the movable, and the Arm the fixed Point, these Muscles instead of drawing the Arm towards the Clavicle, draw the Clavicle towards the Arm. The Action of the little Pectoral may somewhat counter-balance it, as it keeps the Scapula under, being attached by it's Tendon to the coracoid Process.

The Case is nearly the same with a Displacement length-wise, where the Muscles likewise have a great Share. It is certain that the End of the Clavicle joined to the Acromion is drawn downwards by the Deltoid, because the Clavicle being fractured can no longer serve as a Support, whereby instead of drawing the Arm towards the Clavicle, it on the contrary draws the Clavicle towards the Arm.

The other Extremity of the Clavicle, next the Sternum, changes Place very little, nevertheless it may be drawn upwards, or remain in it's natural Situation, when the Sternomastoideus, Subclavius, and the Portion of the Pectoralis major attached to it, act differently.

The Pieces of the broken Clavicle may likewise displace lengthwise, either by the Figure of the Fracture, as when it is oblique, or by the Motion of the Arm, when it is carried forwards upon the Breast; for the Use of the Clavicle is to keep the Arm at a Distance from the Thorax. Nevertheless, the Portion of the Clavicle attached to the Arm, that is to the Acromion, may happen to slip under the other, because this is articulated to the Sternum, and can scarce change Situation, as afore-mentioned.

The Signs of those Species of Fractures are nearly similar to those of others, but one is peculiar to them; to wit, the Arm falls upon the Breast, the Fore-Arm forwards, and in a State of Pronation, and then the Patient cannot move the Arm.

The Causes are also like those of other Fractures, as Blows, Falls, &c.

The Prognostic is the same.

When the Fracture is recent, and without apparent Accidents, it is easily reduced, but a Swelling frequently supervenes

venes, which may deceive : This the Surgeon is to attend to, in order to prevent the terrible Consequences of a Mistake.

It is easily reduced, but difficultly kept so, especially when oblique ; First, because the Ends only touch by a very small Point of Surface ; Secondly, because the Bandage cannot surround the Fracture, as in those of the Extremities ; Thirdly, the Weight, and Motions of the Arm continually displace the Piece joined to the Shoulder.

In order to the Reduction of the fractured Clavicle, the Patient is seated upon a low Chair, without Arms, or upon a Bench. The Surgeon applies his Knee against the Spine betwixt the Shoulders, after having placed a Compress, for Fear of hurting the Patient, particularly if he is thin. He takes hold of each Shoulder with his Hands, and pulling them equally backwards, whilst he pushes the Trunk forwards with his Knee ; he assures himself by these Motions whether the Pieces are difficult to be reduced. Having informed himself by the Extension, and Counter-Extension, he puts an Assistant in his Place, to perform the same Operation, observing to keep the Parts in the same State of Extension, and he places himself before the Patient to make the Conformation.

I said the Surgeon ought to make the first Trial, and not the Assistant, because it frequently happens, that the Pieces are thought to be placed in Apposition, when they are not, which through the Pains the Patient feels obliges us to the Removal of the Dressings, and a Repetition of the Extension, and Counter-Extension. Therefore, to obviate all this, it is proper that the Surgeon should examine with his Fingers, whether the Pieces are even, and whether the Clavicle is of the same Extent as the sound one. In Case the Pieces had not been reduced, the Surgeon must conclude, that he, or the Assistant were not strong enough.

It is difficult to be certain, as has been said, of the Fracture of the Extremity of the Clavicle joined to the Acromion, especially when only a small Portion, which is attached to, and sustained by the Trapezius, is separated. Sometimes the Extremity of the Acromion is also fractured ; the Distinction is no easy Matter.

In order therefore to ascertain these Species of Fractures, the surest Way is to inquire how the Patient fell, or how he received the Stroke. If the Fall has been perpendicular Head foremost, or if the anterior Part of the Scapula has been struck against a hard Body, a Fracture must be supposed. This has been observed in two particular Cases.

OBSERVATION I.

THE first happened to a Farmer, who was mounted upon a Cart loaded with Straw. Falling asleep, the Motions insensibly threw him off, he fell Head foremost, the posterior Part of the Acromion and Clavicle pitched upon the Wheel, which flung him some Distance from the Cart. He only felt a Numbness at the Instant, but afterwards he could not move the Arm. The Surgeon of the Place only discovered a great Contusion, he bled him, and applied a Plaster in Form of a Sear-Cloth upon the Bruise. Nevertheless the Patient, though he moved it ever so little in certain Directions, felt violent Pains. This Uneasiness made him ask Assistance. The Plaster being taken off, a Swelling common to Fractures appeared. After having made different Motions, although with Difficulty and Pain, the Fracture was ascertained; which appeared to be of the Extremity of the Clavicle and Acromion; wherefore the Patient was seated upon the Edge of his Bed, the Arm was drawn gradually and perpendicularly downwards. The Head of the Humerus being removed a little from the Cavity of the Scapula, by the Pressure of the Thumb, the broken Pieces were felt to move, and the Patient found it out by the Pain, and a slight Noise which he said he heard. When the Head of the Humerus was pushed against the Acromion, he was relieved, the Fore-Arm having thereby Liberty to bend. By supporting it in that Situation, and the Arm being pushed from below upwards, the Patient moved it without Pain; this is easy to conceive, as the Pieces were not dragged by the Weight of the Arm, and Fore Arm.

OBSERVATION II.

THE second Case is nearly similar. A Labourer falling from a Scaffold upon a Pent-House, pitched upon the superior Part of the right Shoulder. He felt a violent Pain, afterwards a Numbness in the whole Extent of the Arm and Fore-Arm. He was instantly assisted. As he was thin, it was not difficult to discover the Fracture, which was of the Acromion only. The same Method was practised as afore described, and the Patient was relieved, and cured without suffering much.

Besides the Species of Fractures to which the Clavicle is exposed, Tumors more or less considerable happen to it, this is observed in rickety Subjects three or four Years of Age, where a Protuberance surrounds the middle Part of the Clavicle, and renders it very liable to be broken.

The Exostosis is a Tumor of nearly the same Nature, it's Difference only consisting in the bony Juices, which produce it.

it. That which is venereal is very evident. The Signs are the same as those accompanying the Exostosis of other Bones, viz. Smart, and acute Pains, and other Symptoms peculiar to the Disease. If it is not remedied, a Caries, and Ulcer succeed. It is not the same with the Exostosis owing to a scrofulous Virus, the Tumor forms, as it were, insensibly, the bony Juices have less Consistence than in the venereal; if it degenerates into a Caries, and Ulcer, it resists a longer Time.

Some Practitioners believe that the venereal Virus is the Principle of all Exostoses; nevertheless the contrary may be supposed by Facts authorised by Practice, and this young Surgeons should attend to in the Treatment of those Diseases; for may not a Blow, a Fall, a violent Compression, contuse the Periosteum of that Bone, especially in thin People? From thence will ensue an Inflammation, which will distend, and lacerate, the Vessels that furnish the ossific Juices. What will become of this Juice then? It must absolutely extravasate, and accumulate. As it's Increase irritates the nervous Fibres, then the Pain becomes more sensible, the Motions of the Arm are more restricted, it is necessary to try to stop it's Progress by the Use of Deobstruents, and Resolvents. I am going to relate an Example of this last Species of Exostosis.

OBSERVATION III.

MR.——, a Man of Learning, and distinguished Merit, sixty Years of Age or thereabouts, of a dry and thin Constitution, whose Clavicles were very prominent, and the Teguments consequently very thin; having put on a new Coat, did not attend to it's binding him extremely tight towards the Clavicles. Some Days after he felt a Pain in the Middle of this Bone on the right Side, with Redness of the Skin. This Pressure was nevertheless so violent that the Periosteum was contused, since in the End a Tumor appeared there, which increased visibly, and put him to great Pain, especially in the Motions of the Arms, which in Length of Time were very much confined. The Application of dissolving Plaisters, and slight Frictions with Ung. Mercur, reduced the Exostosis to the Size of a small Walnut, the Pain decreased insensibly. As the Teguments were thin, and unprovided with Fat, a little Abscess appeared upon the Tumor. It was brought to suppurate, and it cicatrised. It is proper to observe, that the Patient at this Time can only perform certain Motions with his Arms. The Extravasation of the nutritive Juices ought only to be attributed to the mere Contusion of the Periosteum,

teum, which occasioned a Rupture of the Vessels; there is no Room to suspect a particular Virus.

OBSERVATION IV.

THE Child of a Bacon-Seller, ten or twelve Years of Age, being on the Ground, received a Kick towards the Middle of the right Clavicle, which fractured it. No Care was taken of it, though it was well known that he could not use his Arm, and that they were obliged to assist him in dressing and undressing. Near fifteen Days elapsed under this Neglect, Advice was at last asked. The Part was very considerably swelled, and the Arm was very near the Ribs, and could scarcely be separated. Notwithstanding the Swelling, the Deformity of the Clavicle owing to the irregular Extravasation of the offic Juices was discovered, which nevertheless did not prevent the Formation of a large Tumor in a Subject of that Age. The Callus being thus advanced, it would have been impossible to have performed, or attempted the Reduction, without breaking the fractured Place again. To spare the Patient the Pain he would have suffered, and withal prevent his being lame, emollient and resolvent Cataplasms were applied, and some Frictions were made with the Ung. Mercur. the Arm was put in Motion from Time to Time, being gradually carried from the Ribs, the Fore-Arm and Arm were supported by the Sling. A Plaster composed of equal Parts of that of Cicuta de Vigo, and Mucaginibus, was afterwards used; which was continued for fifteen Days, at the End of which Time, Extension and Counter-Extension could be easily performed, and the Child was perfectly cured.

It is proper to describe the Apparatus suitable to each Fracture of the Clavicle.

Bandage of the oblique Fracture.

THE oblique is the most common. Let us suppose it is the right Clavicle. One of the Assistants holds the Arms backwards, as before mentioned. The Compresses in Form of false Junks are placed, the one above, and the other below the Clavicle, one of their Ends is folded to fill up the Spaces there; they are to be more or less thick according to the Patient's Plumpness. Upon these two graduated Compresses are placed two long ones, crossed in Form of an X to fill the Vacancies compleatly, then two Paste-Boards dipt in the Defensive, the one above, and the other below. Some apply but one somewhat large, and notched at it's Extremities. The whole is covered with a square Compress.

press. After which is placed a Cushion, or a thick Compress under each Axilla, which must be secured by another long Compress folded in one double, which crosses upon the Shoulder; it is fastened by a Pin. Then the Bandage is applied, which is nothing but the Stellate joined to the Spica. We then begin the Stellate by applying the End of the Band obliquely upon the Breast, passing it over the right Shoulder, carrying it under the Axilla. It is brought forwards, and crossed upon that Shoulder; then it is passed backwards to go under the left Shoulder, carried forwards, and passed over it, and brought down betwixt the Shoulders where it is crossed, other two are made in the same Manner; then the first End of the Band is covered by ascending from the left Axilla to the right Shoulder; after which it is passed under the Axilla of the same Side, and carried forwards upon the Shoulder to make the first Spica; it is carried backwards under the left Axilla, remounting forwards spirally upon the right Shoulder, going down again under the Axilla, it is again carried upwards upon the same Shoulder, where the second Spica is made; it is again brought down backwards, being always passed spirally under the left Axilla, it is carried forwards over the right Shoulder, passed under the Axilla, and upon the Shoulder for the third and last Spica; from thence it is carried from behind forwards under the left Axilla, the fore Part of the Breast is surrounded circularly, and a circular Turn is made upon the superior Part of the Arm, having placed a rolled Compress in manner of false Junks, to guard the Vessels from the Compression of the circular Turns of the Band. Having made two Circumvolutions, we carry the Arm backwards, and returning by the left Axilla, finish upon the Breast, where the Band is fastened. Then the Napkin is applied to support the fore Arm, and Hand armed with a Cushion.

Bandage of the transverse Fracture.

THE Ends of the Bone being replaced, the Shoulders, and Arms are put in their natural Situation, viz. they are carried neither too forwards, nor backwards. First, the Compresses are placed in Form of false Junks, to fill up the Spaces above, and below the Clavicle. Secondly, a small Cushion is also applied under the Axilla of the fractured Side. It is secured by a long Compress, whose Ends are crossed upon the Shoulder as in the other Fracture, and it is fastened by a Pin; then the descending Spica is applied without the Stellate, it is made in the same Manner as that used for the oblique Fracture. What is peculiar to this Bandage, is that after a circular Turn is made round the Arms, instead of carrying the

Arm backwards, we rather bring it forwards, and make a circular Turn round the Body to return to the Arm, and there make another circular Turn, which carries it backwards. Thus the Arm is so kept in, that it can neither move forwards nor backwards, and the Band is finished upon the Breast.

Others use two Shoulder-Pieces of Leather, which are joined by a Strap, that passes into both, and which is tightened as much as is necessary, to keep both Shoulders backwards, Care having been taken to fill up the Vacancy betwixt them, with some soft Napkins. If on the contrary the Fracture is transverse, all the Heads of the Band must push from behind forwards. It is seen from hence, and from this Instance alone, that a Surgeon, to perform the operative Part of Fractures well, ought to be carefully instructed in the Figure of each bony Piece, and the natural Situation of each Limb, in the Force, and Direction of the Muscles, and even the different Actions of the same Muscle according to the different Plans of which it is composed; this is discovered by the different Figure that the fractured Parts take. It is also necessary to be informed of the Situation and Course of the Vessels, and their neighbouring Tendons. When he shall have all these Objects present, he will be able to reduce a Fracture well, make a good Conformation, and secure the reduced Pieces by a proper Bandage.

The Fracture of the Extremity of the Clavicle, and Acromion, may frequently deceive. Sometimes the Swelling, and Tension of the Arm are so considerable, that the Motions are with Difficulty made, that likewise has been taken for a Luxation of the Head of the Humerus, which was nothing but the Fracture of the above mentioned Pieces. The Patients are consequently exposed to undergo useless, and even hurtful, Extensions, and Counter-Extensions. Some by such like Treatment, have remained Cripples; viz. to some has happened an Ankylosis of the Arm with the Scapula; to others that the Collision of the Cartilages, and Extensions of the Ligaments have caused, either the Cavity of the Scapula, or the Head of the Humerus to crack and dry; whereby the Juices have changed their Figure, and Size, Accidents which the Patients have suffered for the rest of their Days. The daily Experience of those who practise in the Hospitals has furnished them with such Examples. We will also observe, that the Bandage proper for these Species of Fractures is the same as that made Use of in the others, except that the Circumvolutions of the Band must quite touch the Angle of the Scapula to press upon the fractured Pieces, and keep them firm. It is also necessary, in the Application of the Bandage,

Bandage, that the Fore-Arm be bent, and the Arm pushed in a direct Line, as much as possible, from below upwards; that the Head of the Humerus may serve as a Point of Support to the broken Pieces. Besides the Sling commonly made Use of, it is proper to confine the Fore-Arm, and Arm, by some Circumvolutions of the Band round the Body. The Dressings must be oftener removed in these Fractures, than in the others, in order to move the Arm a little, and prevent the Synovia from lodging too long, which might produce an Ankylosis; it is also advantageous, as the Motion gives Ease and Liberty to the Capsula of the Arm, and the neighbouring Ligaments.

ARTICLE II.

Of the Fracture of the Scapula.

THE Scapula is a triangular Bone, very thin in it's Center, and along it's Basis; but thicker at the inferior Costa. It has a superior and inferior Angle. It's superior external Part is divided by a Spine, which gradually becomes prominent. It's Extremity, which is large, forms the Acromion. The anterior Part of the Scapula has a Cavity to receive the Humerus, and from it's superior Part rises a Process called Coracoid.

The Scapula is situated at the posterior and superior Part of the Ribs, a little obliquely. These are the essential Parts composing it, which may undoubtedly be fractured, especially by Fire-Arms.

It's Spine, Acromion, and Body are most exposed to Fractures from Falls, and bruising Blows. The Coracoid Process, and Neck of the Scapula are less so. It is covered, both internally, and externally, with Muscles, which on certain Occasions may preserve it.

The Scapula is only fixed upon the Ribs, by Muscles, some of which are peculiar, and others common to it; which renders it's Diseases more complex. Forwards it gives Attachment to the Serratus major anticus, and Pectoralis minor, backwards, to the Rhomboides, it's upper Part is sustained by the Levator; the Cucullaris covers almost all it's posterior Part, and is attached to all the Extent of it's Spine, Acromion, and ends to a Portion of the Clavicle. Besides these Muscles, it's internal Part is lined with the Subscapularis, which is very thick; it's superior external Part is covered by the Supra-spinatus, it's inferior by the Infra-spinatus. To the Rest of it's Circumference other Muscles are inserted.

Notwithstanding the great Number of Muscles that keep the

Scapula in it's Situation, it would nevertheless have been drawn forwards by the Weight of the Arm, if the horizontal Position of the Clavicle from before backwards did not oppose it by one Extremity, which is joined to the Acromion by a strong Ligament; that serves it as a Support.

Although the Number of the above-mentioned Muscles be considerable, they do not prevent the Scapula from being fractured, as has been said. It's Body may be broken in many Pieces, and those of different Figures, which yet may not change their Situation; this depends upon the different Bundles of Fibres belonging to the above Muscles, which are inserted into the Periosteum, that covers it. If the Pieces are displaced, it must be occasioned by Gun-Shot, or a pointed Instrument, that pushes the divided Parts inwards, or outwards.

The superior Angle may be broken transversely, and totally, and in this Case the upper Portion will be removed from the other by the Action of the Levator.

The Middle of the Scapula is commonly fractured lengthwise. If it extends beyond the Spine, it must necessarily be divided transversely. This Fracture is very difficult to be found out, because the Pieces can noways separate, and yield to the Touch.

The Basis, and inferior Angle of the Scapula are more exposed to Fracture than the inferior Costa, which is protected by the posterior Part of the Arm.

This Bone is fractured obliquely in the same Manner as transversely; but I believe it is difficult, if not to say impossible; but when it happens the inferior Piece is engaged above, or below the superior, by the Action of the neighbouring Muscles; the scapulary and Infra-spinatus Muscles would oppose it, they being attached to the whole Extent of the Surfaces of the Scapula.

The Fracture of the Acromion is the most frequent of those of the Scapula, those of the Neck and coracoid Process are possible, as shall be spoken of afterwards, without any Mention of those occasioned by Gun-Shot. They happen in the most latent Parts.

The Spine of the Scapula is more commonly fractured than is imagined. By Reason of it's Eminence, and Surface, a Blow struck upon it never fails to fracture it. A Fall may produce the same Accident.

The Fracture of the Acromion is also easy, as it has a sufficient Surface, and rests hollow, being only sustained, and attached to the Clavicle, by Ligaments which cannot resist the

the Impression of the Blow, or Fall. Although the Head of the Humerus is lodged below, the Distance is more than enough for it to happen, and even, if the Head of the Bone was sufficiently firm to resist, the one or the other Part might be fractured, or crushed to Pieces.

A Portion of the Clavicle is frequently fractured at the same Time with the Acromion, as we have said in speaking of the Fracture of the Clavicle. What renders the Fracture of the Clavicle more easy than others, is it's being only covered by the Teguments.

As for what remains, I have seen several People, who, having fallen, or received a Blow upon the superior Part of the Shoulder at the Junction of the Acromion with the Scapula, have been disabled from raising the Arm, and have felt very acute Pains, though it was moved ever so little; nevertheless without a considerable Swelling of the Part.

It is necessary therefore to be very careful to distinguish a Fracture from a Contusion, Collision, or Compression of the Ligaments; this is the true Cause of the above mentioned Accident. We have given the Means of discovering the Fracture in speaking of that of the Clavicle.

We have shewn that the Fracture of the Neck of the Scapula, and coracoid Process, is the least frequent; but, when it happens, the Symptoms are very bad and dangerous.

It should seem indeed, that these two bony Parts are secure from Injuries, and the Impression of Blows; for the coracoid Process is hid by the Clavicle placed above it, and it is bound closely to it by Ligaments. As for the Neck of the Scapula, it is provided with Muscles, and Tendons, that surround it, and it is guarded by the Clavicle, and Beginning of the coracoid Process. I am going nevertheless to relate an Example where these Parts were found intirely separated.

OBSERVATION.

A Young Woman, about twenty Years of Age, fell into a Quarry, where she was found dead, for Want of immediate Assistance. Her Body was almost totally contused. The Ribs were fractured in many Places. In examining the Arm, I thought from the Freedom of it's Motion, that it was luxated. I made an Incision in the Teguments, and Muscles, I opened the Capsula; the Head of the Humerus occupied the Cavity; but I then perceived the Fracture of the Neck, and coracoid Process, which were totally separated from the Rest of the Bone.

The Signs which manifest the Fracture of the Scapula are not

not always obvious; this depends upon the Situation of the Fracture, it's small Extent, it's Figure, the Plumpness of the Person, the Symptoms happening at the Time of the Blow, or Fall, or those appearing afterwards. Moreover, the Position of the Scapula upon the Ribs, and the Muscles surrounding it on all Sides, cause the Pieces to remain generally in their Place, which does not happen in the Fractures of other Parts.

The Signs most certainly to be depended on, and which ought to be recured to, are the Touch and Compression, whereby to assure ourselves whether there be a Crepitation. Wherefore, in the Fractures of the Scapula, it is necessary to raise the Arm in different Directions, move it, bring it forwards, and carry it above the Head. An Assistant supports it in this Situation whilst the Surgeon examines the Place where the Fracture may be.

The common Signs, and which may be doubtful in this Case, are the Swelling of the Part, the Emphysema succeeded by an Œdema, a violent Contusion, an Ecchymosis, the Loss of Motion of the Arm, or the great Difficulty of moving it, a hard and interrupted Respiration, Shootings, Prickings, the Starting the Patient feels, when he tries to move, or change his Situation. A Numbness of the Part, and Arm, likewise supervene, and it is sometimes attended with a Fever.

But these Signs may deceive, as the Contusion may occasion them all, and, as it is impossible to embrace the Scapula, and as Flexion and Extension cannot be performed, no Risk is run in placing the Patient properly to appease his Pains.

A just Prognostic of the Fractures of the Scapula cannot be made, unless their Species, and Symptoms, be previously known. That caused by Gun-Shot is always bad, as it is frequently accompanied with Splinters. In such a Case, we cannot dispense with making Incisions proportionable to the Wound, to give an Opening to extraneous Bodies, or Splinters, that may remain there; lastly to set the bruised Part at Liberty. The Fractures of the Body, Angles, and Acromion; occasioned by Blows, or Falls, only require Re-Union, and the Bandage. The Prognostic of that of the Neck of the Scapula, and coracoid Process is that, let what Precaution soever be taken, the Patient will remain lame.

A proper Apparatus, and Bandage must be used in the Treatment of the Fractures of the Scapula. In those of the Body, Spine, and inferior Angle, the Pieces being in Situation, a Compress a Finger's Breadth thick of the same Size, and Figure of the Part, being moistened in a proper Defensive, is applied

plied upon the whole Extent of the Scapula. Over it a Paste-Board, similar to the Compress, wet, that it may stick, and mould itself to the Figure of the Scapula. It is to be covered with a square Compress, the whole kept on by the Napkin, which is the Bandage of the Body, and the Scapulary, or else the Quadriga or stellate Bandage is made Use of. The Arm must be brought near the Ribs, and supported by the Sling, that it's Weight may nowise displace the Scapula.

The Fracture of the Acromion, Neck, and coracoid Process require a Bandage quite different from those above proposed. The Spica is proper, in like Manner as it is used in the Fractures of the Clavicle, with the Apparatus and Sling to support the Arm. It is proper that the Napkin should raise it up a little, that the Head of the Humerus may serve as a Support to those Parts.

The Fractures complicated with Wounds require the same Treatment as those of other Parts.

ARTICLE III.

Of the Fracture of the Sternum.

THE Sternum in the Adult is composed of two Bones intirely spongy. The last is the longest. It's Extremity terminates by an Appendix which is called Ziphoides. It remains cartilaginous to a certain Age. These two Bones occupy the Middle of the Thorax. They are supported by the Cartilages of the true Ribs, which they receive. The first Bone receives the Clavicle laterally.

The Bones of the Sternum may be depressed inwards, or forced outwards, in considerable Fractures of the Ribs. Blows, or Falls, may break them in different Places, the Pieces may be even, or not, viz. one Piece may be forced inwards whilst the other remains in Place. In this Case the Fracture is easily discovered by the Deformity that is felt, but those where the fractured Pieces preserve the natural Situation are more difficult to be found out; for, they are frequently succeeded by a Swelling, which renders the Touch useless, and besides, the Pieces do not easily yield to the Pressure made upon them by the Fingers.

The Cartilago Ensisformis may be depressed, or fractured. It's Depression and Fracture, occasion very terrible Symptoms, and which even cannot be remedied, especially in old People, where the Cartilages of the Ribs are almost ossified. The Accident most to be feared is the Rupture of the mammary Arteries, and Veins. In this Case there is no Remedy, let what

Pre-

Precaution soever be used, the Death of the Patient is inevitable, particularly when it is the Trunk of the Artery. This Accident, and the Cause of the Disease cannot even be known but by opening the Body.

The first Bone of the Sternum is less liable to be depressed than the second, but it may be fractured. The Depression, or Fracture of the Xiphoid Cartilage compresses the Liver, and Stomach, which excites the Hiccup and Vomiting.

The Signs and Symptoms of these Diseases instantly come on. The Difficulty of Respiration, and the Palpitation soon appear; the Systole, and Diastole are performed with Difficulty; this obliges the Blood to stagnate in the Cells of the Lungs, and there causes a Phlogosis, which ruptures the Vessels, whence the Patient spits Blood.

The Prognostic is sometimes doubtful, especially in strong and robust People. If we perceive that the Blood flows copiously towards the Head, and disorders it, that a Fever comes on, there is little Hope. It may be said that all these Diseases are mortal, to some at the Instant of the Blow or Fall, and to others some Days after; nevertheless there have been Patients whose Constitutions have held out, and have been cured.

I am going to give some remarkable Observations upon this Subject.

OBSERVATION I.

A Young Man playing at Skittles, after delivering the Bowl, bent forwards towards the Ground. At the next End, repeating the same Posture, he happened to fall upon a large Flint-Stone, which depressed the second Bone of the Sternum with Fracture and Splinter, he died upon the Spot; I opened the Thorax, and found, besides the Fracture, the Pericardium lacerated, and the right Auricle divided into three or four Shreds.

OBSERVATION II.

A Quarry Man laid upon one Side under his Work, the Stone which was more than five Feet long fell upon him. The Compression was so violent, as well by the Weight of the Stone as by the Resistance of the opposite Side, that the second Bone of the Sternum was separated from the first, and made a Wound in the Teguments; the wounded Person died instantly. The Heart and Lungs were found entirely lacerated.

OBSER-

OBSERVATION III.

A Fruiterer, about eighty Years of Age, went to buy Wood. Being in the Timber-Yard, he was willing to rest himself upon a Log fixed in the Ground. A Pile of Wood gave way, which hurt him much. He had a considerable Wound in the Thigh towards the great Trochanter, a second in the Breast, where two Cartilages of the true Ribs were forced out of their Articulations with the Sternum. The Cartilages were ossified. The Sternum was also fractured transversely. The Symptoms attending this Disease were calmed by Bleedings, which were repeated in small Quantities, upon Account of his Age, the Cartilages were replaced, and he was cured in less than six Weeks, and lived many Years after, but an Invalid.

OBSERVATION IV.

THE Ribs, and Sternum, are likewise fractured by an internal Cause; when there is a Caries, from frequent Palpitations, or else an Aneurism. An Ebonist had an Aneurism of the Aorta ascendens for more than two Years. The Tumor enlarged so much, that it's Motions elevated the Ribs, and Sternum. He died suddenly by the Rupture of the Sac. The Body being opened, we found the Cartilages of the second and third true Ribs separated from the Sternum, the Bone fractured, and carious about two large Finger's Breadth.

The simple Fracture of the Sternum only calls upon us to prevent any bad Symptoms, which is done by Bleedings in the Arm; or if the Head suffers, in the Foot; by an exact Diet, *calming* Drinks, and by Care to keep the Body open.

Whenever the Bones are known to be depressed, and fractured without great Division, the Patient will be relieved by being placed upon a Chair, and having the Ribs pressed on both Sides, from behind and forwards, which is done to raise and push the Sternum outwards. This Operation has sometimes succeeded by the Flexibility of the Cartilages; but Subjects are met with whose Cartilages are stiff, and, in a Manner, inflexible. Then, if the Means employed do not relieve the Patient, he must be laid on his Side upon something that resists. On the opposite are applied the Palms of the Hands over the whole Extent of the true Ribs, compressing them from behind forwards, and in order to quicken the

the Reduction, an Assistant pushes the Vertebrae from without inwards. The Patient must be held firm during the Operation. If after all these Attempts we still have no Success, the only Method to be taken is to make an Incision in the Teguments, and use the Trepan: That is the Opinion of all Practitioners.

In Case an Extravasation of Blood, or a Collection of Matter is suspected, Recourse is had to the Trepan. But it is proper to observe concerning the Operation of the Trepan in the Bones of the Sternum, the Design of which is to evacuate Blood, or Pus, from the Thorax, that the Authors, who treat on this Subject, give no diagnostic Signs to distinguish this Extravasation, and are equally silent upon the Success of the Operation. It is not the same with the Operation of the Trepan in the Bones of the Cranium, the Signs requiring it are obvious; therefore the Comparison of the one with the other, is very little instructive in Practice.

The Apparatus and Bandage in this Kind of Wounds, or Fractures, consists in applying some Compresses wet in a proper Liquor upon the Sternum. They must be kept on by the Napkin, and Scapulary. To render the Patient's Respiration easy, I imagine it would be proper to lay upon each Side of the Ribs a moderately thick longitudinal Compress, five or six Fingers broad, to serve as a Point of Support; especially if he is attacked with a dry Cough, which succeeds those Accidents.

ARTICLE IV.

Of the Fracture of the Vertebrae.

THE Vertebrae are liable to be fractured, notwithstanding the Reasons that may be alledged against it, and which seem to oppose it; first, that their Bodies vary in Size; secondly, that they are entirely spongy; thirdly, that their Bodies are joined by Means of intermediate Cartilages, which are flexible, supple, and capable of bending, and yielding to external Impressions; fourthly, that the Cartilages are thicker where they have most Motion, as in the Neck, and Loins; fifthly, that the Articulation of their oblique Processes allows them only a half Opening in Flexion, and that they slide upon one another in Extension; Sixthly, that the cervical, and lumbar Vertebrae are surrounded on all Sides with Muscles; seventhly, that the Dorsal are guarded by the Roots of

of the Ribs. Nevertheless we are going to prove that these Bones may be fractured.

The Spinal Processes of the dorsal and lumbar Vertebrae are most commonly fractured. The last are most subject thereto, as they are long, and leave a Space between them; the first on the contrary are placed upon one another, consequently they may sooner be violently contused than fractured, but their Fracture is possible.

The Causes of the Fractures of the Vertebrae are violent Falls, as from a very high Place, or a Pressure betwixt two Bodies.

The Signs and Symptoms manifesting the Fracture of the Vertebrae, are the Loss of Motion, Convulsions, a Paralysis, the involuntary Discharge of the Fæces, and Urine, and even sometimes their Retention. Nevertheless there are Cases, which are equivocal, as a Fall may occasion the same Symptoms; because one or several Vertebrae, particularly the Lumbar, may happen to be depressed. Sometimes even the Fall produces such a Concussion in the whole Extent of the Spine, that it is impossible to distinguish whether there be a Fracture. Lastly, a violent Contusion of the Os Sacrum produces the same Effect, as it's Middle is only covered by the Teguments.

The Os Coccygis may be fractured, or displaced; but the succeeding Symptoms are less terrible than those just now mentioned.

The Prognostic of these Disorders is generally very bad, as Experience proves that they always threaten great Danger; for which Reason the Surgeon ought to be very circumspect, and promise nothing.

As for the Cure, let the Structure of these Parts be considered ever so little, it is apparent that what is employed in other Fractures, as Extension, and Counter-Extension, becomes useless, and even pernicious in these. Nevertheless we must not neglect to make Use of all the other Expedients the Art teaches us, especially if the Spinal Processes of the Lumbar Vertebrae are suspected to be fractured.

OBSERVATION I.

A Young Bricklayer having fallen backwards from the Top of a House, the whole Force of the Fall was upon the Lumbar Region. Being carried Home, a violent Contusion with Ecchymosis was found. The Patient could not move; if it was attempted to raise him upon his Breech, he was sorely pained, and cried out frightfully; if he was turned upon his Side,

Side, the Pain was less acute, and still less when his Thighs were bent, and his Head and Breast inclined forwards. Some Days after this Accident, the Contusion and Ecchymosis being diminished, he moved himself a little. He was seated in his Bed, and the Fingers being applied upon the Processes, where he suffered most, two spinal ones were perceived to be fractured, but without Displacement. The Fracture was proved to the Patient's Relations, by making them place a Finger upon the Extremity of each of them; for, by pushing both gently sideways, they yielded and inclined towards the Place where they were thrust. The Patient was indisposed more than six Weeks, not upon Account of the Formation of the Callus, but by Reason of the Contusion of the Tendons, and Aponeuroses of the neighbouring Parts.

Gun-shot most frequently occasion these Wounds. They are always bad and tedious, even when the principal Parts are not concerned; but the greatest Number are mortal, by Reason of the Displacement that these Blows occasion.

OBSERVATION II.

A Dealer in Horses in a Dispute was shot with two Balls from a Pistol. The one passed through the Teguments, and the other penetrated to the superior, and lateral Part of the Neck, of the right Side, a little anteriorly. He run at the Man who had shot him, but having made twenty or thirty Steps, he fell, and became insensible. The superior Extremities, and the whole Extent of the Thorax were convulsed, and the inferior Extremities remained paralytic. He continued twenty-four Hours in this State; but Bleedings in the Arm, and Foot, immediately repeated, he being strong, and robust, brought him to himself, though he remained speechless, his Tongue being paralytic. He died the fourth Day. Upon Examination, in following the Course of the Bullet, we found it, and the transverse Process of the second Vertebra intirely fractured, and depressed, so that the Marrow was compressed, and all the large Nerves passing out of the Skull on that Side were bruised. An Incision was not attempted, where the Ball entered, on Account of the enormous Swelling that had seized upon the Neck, and for Fear of interesting the large Vessels situated there.

It happens in Diseases from an internal Cause that the Bodies of the Vertebrae become carious, and that they afterwards fracture; this I have seen on many Occasions in opening Bodies. These Diseases are always mortal.

ARTICLE V.

Of the Wounds of the Vertebra.

IN Order to find out these Diseases, it is necessary to be acquainted with the Structure of the Spine.

All the Parts of the Spine are closely united by Cartilages, which exactly fill up the Spaces left between them. Their Structure is such that they are thicker forwards than backwards, and in like Manner, where they have most Motion. It is seen from thence, that this Junction of the Bodies of the Vertebrae is a true cartilaginous Symphysis.

The Vertebrae are articulated with one another by their oblique Processes, amongst which there are generally two, that are more or less hollowed, and other two more or less elevated. Each of these Processes is incrusted separately with a smooth, glistening Cartilage, and bound together by circular Ligaments, more or less loose, according to the different Parts of the Spine. This double Kind of Junction renders it proper for various Motions.

It bends forwards by Means of the inter-vertebral Cartilages. Which is the Reason, that they are very thick where it has most Motion, as in the Loins. Their Structure favours this Use, for they are thicker forwards than backwards; because the Spine bends more in that Direction. For the Freedom of that Motion, the oblique Processes must obey; thus the Flexion of the Spine forwards is effected by Means of the Suppleness of the Cartilages, and Play of the oblique Processes, which slide a little upon one another.

The Spine only bends backwards by the Play of the oblique Processes, and Distance between the spinal ones. Hence, in the Loins, the Play of the oblique Processes is very free, and the Distance of the Spinal very considerable.

The Spine bends to the Right and Left by Means of the Articulation of the oblique Processes. For Example, it is inflected on the right Side, when all the oblique Processes of that Side close by sliding upon one another, and those of the opposite Side half open.

Lastly, the Spine makes a half Turn to the Right or Left, because the oblique Processes, and even the Bodies of the Vertebrae can turn a little upon themselves, so that the whole makes a half Turn in a spiral Form. We now see why the Spinal Processes of the Lumbar Vertebrae are straight in respect to the Spine, and why the transverse are long, slender, and straight, like the spinal. This Disposition renders the Inflection of the

Spine backwards, and laterally, more easy, and free; because the Trunk happening to bend, these Vertebrae have all the Play from one Process to the other, viz. that they may run over a great Space before they touch. In the second Place, the Length of these Processes serves to increase the Force of the Muscles attached to them, by removing them further from the Center of their Motion. It is not the same in the Back, where all is made to give Firmness, and secure the Capacity of the Arch of the Thorax. Therefore the Spinal Processes are laid upon one another, and touch, and there is only a small Space from one transverse Process to the other. They are besides as firm as Stakes, on Account of their close Connexion with the Ribs.

The above mentioned Pieces composing the Canal of the Spine, may be fractured, or dislocated.

As for their Fractures, they happen to the Body of the Vertebra, or it's Processes. The first are rare, because the Body of the Vertebra is greatly hid, and covered with a Quantity of Muscles. These Fractures may be occasioned by Thrusts with pointed Instruments, as Swords, Knives, &c. or by Bullets in Gun-shot Wounds, or by bruising Instruments.

In the first Kind, the Marrow does not suffer so much as in the last, which are almost always mortal. The Reason is plain. The Body of a Vertebra cannot be fractured by a bruising Instrument, or by a Shot, without the Marrow being hurt, or at least greatly shook.

As for the Fracture of the Processes, the spinal are most exposed to it; because they are most so to the Impression of external Bodies; but these Fractures are not so dangerous as those of the Bodies of the Vertebrae. Nevertheless they are rarely fractured without the Vertebra being greatly injured, and consequently the Marrow.

The transverse Processes may be fractured by bruising Instruments, and these Wounds are almost always mortal; or by piercing Instruments, as Spits, Swords, &c. and these are less dangerous. The Fractures of the Spinal Processes may be easily discovered by the Touch, or by a Crepitation, when the Patient's Spine is bent, or by the Pain it gives him. The Fracture of the transverse Processes has been spoken of in the preceding Article. Therefore the Reader is referred to it.

ARTICLE VI.

Of the Fracture of the Ribs.

THE Ribs are the most numerous of all the bony Parts concerned in the Composition of the Cavity of the Thorax. They are of two Kinds, the seven superior are called true, because they are joined to the Sternum by Cartilages; the five inferior have received the Name of false, because their Cartilages are not joined to the Sternum. They are twelve in Number on each Side.

The first true, and last false Rib, are the least; the others are more or less large. Their Figure comes near the Segment of a Circle, more or less convex externally, and the Direction from behind forwards is more or less inclined from above downwards, which holds more especially of the last true, and first false Ribs. They are likewise more or less bulky. They are more solid and compact towards the Spine, very spongy, and larger towards the Sternum.

The true have two Articulations. The first is effected by their Roots with the Vertebrae, and transverse Processes; it is a *Ginglymus* of the first Species. Some Particularities are met with in some of the Ribs, which we need not describe. We shall only observe that the Articulation of the false is freer. The second Articulation of the true Ribs is effected by Means of their Cartilages; which by one End are set into a little Depression at the anterior Part of each Rib, and by their other Extremities are received into the Sides of the Sternum. The Cartilages of the false Ribs are attached to the Side of one another, and have no Communication with the Sternum, as has been said.

The Ribs move upwards, and a little outwards, in Inspiration; and downwards, and recover their natural Situation, in Expiration. This brief Description of their Structure can only be useful to those who have no Idea of the Composition of this Cavity, that they may be capable of remedying the Fractures of the Ribs, and the other Diseases they are exposed to.

The first Rib is rarely fractured; the following, to wit, the second, third, fourth, &c. are more subject thereto. The last false may be classed with the first. As for the other Ribs both true and false, they are continually exposed thereto, either by a Blow, Fall, Compression, or Gun-shot.

The first Rib cannot be fractured except by a terrible Fall, or a violent Compression, occasioned by a Carriage passing over

it; but it never will happen unless the Clavicle is concerned; and as the first is of small Extent, and it's Motions very moderate, especially in the Adult, as it's Cartilage is short, and ossifies early; it is very difficult to come at a certain Knowledge of it. Besides the Clavicle, the Deltoid, and Pectoralis major cover it. It is nearly the same with the following.

As for the last false Rib, a considerable Violence is likewise necessary to fracture it. Besides it's Varieties, which occasion it to be frequently found shorter in some Subjects, though longer in others, it is free, as it were, for it's Cartilage is only supported by Plans of Fibres of the abdominal Muscles. A Fall, Blow, or Compression, are very doubtful Signs whereby to determine the Fracture; for there is frequently a Contusion, Ecchymosis, Pain more or less acute, Difficulty of Respiration, and Motion, let the Part be touched ever so gently; besides, the Rib, having no Point of Support, may yield to the Pressure made upon it, which induces a Persuasion of it's being fractured, or depressed, particularly by some People little versed in Practice, though there be no such Thing.

When there is a Fracture, the Pieces are more or less displaced; and that is what determines the Difference of the Treatment. If they are not greatly displaced, we must content ourselves with covering the Parts with Compresses wet in a proper Liquor, supported by the Napkin round the Body, secured by the Scapulary, and with keeping the Arm still for some Days.

When the Disorder is considerable, either the fractured Pieces are forced within the Thorax, and then they may puncture the Pleura, or rupture some Vessels, or outwards. They may fracture either at the struck Place, or at the opposite Part, as when the Ends of the Ribs are compressed against one another by Blows diametrically opposite. We know the broken Ends are pushed inwards in the first Species of Fracture, and outward in the second.

The Signs of the Fractures of the Ribs are an Unevenness, Crepitation, Difficulty of Breathing, and Pain; nevertheless these two last Symptoms are less felt in the Fracture outwards, because the broken Ends do not prick the Pleura, which is the Case, when the Pieces are pushed inwards, and it renders the Fracture very troublesome, by Reason of the Inflammation that seizes upon that Membrane, or even the Rupture of some Vessels.

These Species of Fractures are never attended with great Uneasiness, because the broken Pieces are not considerably displaced; but we are to try to distinguish clearly the Crepita-

tion

tion accompanying a Contusion; or to express it better, to distinguish the Noise that succeeds the Collision of the Air, from that made by the Friction of two hard Bodies. The first solely depends upon the Air inclosed in Emphysemas, which does not come from the Thorax.

It is proper to observe that the Fracture inwards is very bad, because the Pleura suffers, inflames, and it's Inflammation may be communicated to the Lungs; the Pain of the Side may also be attended with an Hemoptoe, and withal, if the Vessels are ruptured, there will be an Extravasation.

It is of great Importance to distinguish clearly the Inflammation of the Pleura from the Empyema. In order to which, we are only to observe the different Motions of the Respiration, and the Situation the Patient is most easy in, when laid.

In the Empyema, Inspiration is more difficult than Expiration, especially if it is a little full; and the Patient lays more easy on the diseased, than on the sound Side.

The true Ribs are more frequently fractured than the false, because they are supported at each End. They may even be broken near the Extremities: Nevertheless that is not equally true in both; for posteriorly they are covered by so many Muscles that the Impression of the Blow must certainly be deadened, before it reaches the Ribs; whereas anteriorly they are less covered, and only supported by their Cartilages.

As for the false Ribs, their Structure, and Dispositions that are different from the true, easily shew, that they can yield much without fracturing. Some pretend that, if they are pushed inwards, they may remain in that State of Depression, which is contrary to Experience, for they are immediately restored by their Elasticity; but the Pain of the neighbouring Parts frequently gives Room to Quack-Bone-setters to make it believed, that they are depressed, or even fissured at the same Time. In short it is by Gun-shot when that happens, and it is always where they yield the least; to wit, near their Middle, drawing towards the Spine.

The Ribs are commonly fractured by Blows, Falls, Gun-shot, or lastly in Consequence of some long Diseases, which have rendered these Parts carious. There have been seen many Examples of Aneurisms of the principal Arteries contained within the Thorax, which by their frequent Motions have occasioned these Fractures, but they are always preceded by a Caries.

Two Species of Fractures of the Ribs are generally known: The first is when the Pieces are driven inwards; the second is when the Pieces or fractured Ends appear externally. The

Difference

Difference is drawn from the Kind of Fracture, from the Signs known to belong to each; and lastly from their attending Symptoms, &c.

If the Pieces are greatly displaced, and depressed within the Thorax, there is Room to believe, that the Pleura and Vessels having been lacerated, an Empyema is produced. Besides that these Pieces may prick the Lungs, which is very dangerous.

In that Case the mere Motions of Respiration cannot keep the Extremities of the Parts in Apposition, therefore some other Relief must be applied.

If the Fracture of the Ribs is outwards, the Symptoms are not extremely bad; the only Business is to make the Pieces even, and keep them so by the Bandage, which shall be described afterwards. The Bleedings must be in Proportion to the Constitution, and attending, or supervening Symptoms.

If there are certain Signs, that an intercostal Artery is opened, as if the Thrust of a Pike, Bayonet, Knife, or other pointed Instrument, had made a Wound in the Flesh that had penetrated to the Pleura, and fractured the Rib at the same Time, then we should be obliged to dilate the Wound, in order to stop the Blood more easily. The most sure Method in this Case would be the Ligature by Means of a very crooked Needle, armed with a waxed Thread, and a moderately thick Compress to be applied upon the Aperture of the Artery.

Some Practitioners propose the solid, or liquid Caustic. The latter is preferable; but in Case there was no Wound, and we had Room to suspect an intercostal Artery to have been opened, either by Reason of the Instrument, or Violence of the Stroke, or upon Account of a circumscribed Tumor formed there, accompanied with a Lividity and Resistance, which gives Room to believe there is an extravasated Fluid; then we should be obliged to lay the fractured Place bare.

If in a Fracture of one of the superior Ribs an intercostal Artery had been opened by some Splinter, and the Signs of an Effusion were certain, but without Blood extravasated about the Wound, it should be left to close, if possible, and a Counter-Opening should be made at a chosen Place; but if there is an Extravasation, it must be dilated to discharge the effused Juices.

If the Rib is fractured at the anterior Part of the Thorax, which is seldom the Case, the Crepitation is less perceptible, and the Pieces are rarely uneven.

Although the true Ribs are seldom fractured at their anterior Parts, nevertheless there are such Examples. Their Causes are different. Some are internal, as the Consequences of an Aneurism,

rism, or a Caries proceeding from an Inflammation of the Pleura; or, lastly, some particular Viciousness. The external Causes are confined to Blows, Falls. I say nothing of Gun-shot, which are known to take Place in all Parts. These Causes are more or less terrible.

Besides the Fractures of the true Ribs, their Cartilages are sometimes displaced, especially in old People, where their Elasticity and Flexibility are lost, by the Dryness they acquire: They even frequently ossify partially: Therefore they yield less than the Rib itself to Blows, or Falls; consequently, they must necessarily quit the Place where they were engaged. It is commonly the sternal Extremity, that quits it's Place; for that received in the Ribs is set in by a larger Basis than the other. It is proper to observe that in this Sort of Separations, the Portion of the Cartilage out of it's Place is almost always carried outwards, and projects; which can only be attributed to the Bundles of Fibres of the Pectoralis major attached thereto. This Displacement is dangerous upon Account of the supervening Symptoms, which must be prevented, by a proper Reduction.

It is not the same with the Cartilages of the false Ribs. They have no Connexion with the Sternum, being only joined to one another by Fibres of the same Nature. The first are more extensive than the under ones, and that of the last false Rib is free. They are covered by the Obliquus externus, and give Attachment to the Obliquus internus, to Portions of the Transversus, and Diaphragm. They acquire nearly the same Solidity as the Cartilages of the true Ribs, but are not exposed to the same Disorders, because they can yield, and stretch on every Occasion; and if Blows, or Falls make an Impression in these Places, the soft Parts will sooner be injured than their Cartilages. The Difficulty of Respiration, the Tension of the Abdomen, appearing at the Instant of the Blow, or Fall, generally succeeded by a Contusion more or less obvious to the Sight, may deceive, as the false Ribs seem more depressed to the Touch, notwithstanding they are not so. Thus it is not surprizing that many People treat these Diseases as depressed Ribs; but a Bandage well secured, proper Embrocations, and frequent Bleedings, soon free the Patient from the Danger he was thought to be in.

Sometimes Blows, or Falls kill the Patient, either at the Instant, or some Time after; for, as the false Ribs yield, and their Cartilages easily stretch, the Force of the Blow, or Fall, which reaches to the Liver, if it is on the right Side, may divide it into Parcels, and an Hemorrhage

instantly ensues by the Rupture of the Vessels, with which this Bowel is provided; or else it will be so contused, that the Circulation will be partially intercepted, which is equally true of the Secretions. There ought to be no Doubt then that, if the Patient holds out some Days, a Collection of Matter, or Abscess may form, which is perceptible to the Touch, and which the Surgeon even knows by the attending Symptoms, as pungent Pain, Shiverings, Fever, &c.

Finally, the Abscess is not always sure to appear in the convex Part; it is met with in it's concave Part in many People, who are opened, and where, after the Extravasation of the Matter contained in a Portion of the Liver having fallen into the Cavity of the Abdomen, the Pain, Shiverings, and great Tension of the Belly have ceased for twenty-four Hours; but the Symptoms are afterwards renewed with more Fury, a Gangrene ensues, and the Patient dies.

As a Compression may happen as well on the left, as on the right Side, the Spleen may be divided, contused, and attended with the same Symptoms as the Liver. The Stomach may even be hurt. The greatest Part of this Bowel, and a large Portion of the Epiploon, are placed there. The Stomach will be perceived to be injured by the frequent Vomitings, and Hickup. If it is the Epiploon, the Symptoms will be slower; but they will resemble those produced by the Lesion of the Stomach. If the Contusion is obstinate for some Time, and the Liver becomes obstructed, that will occasion a Resorption of the Bile, and the Patient will have the Jaundice, &c.

I have already said that the Pieces are forced within the Thorax, in which Case they may puncture the Pleura, or rupture some Vessels: The Puncture of the Pleura causes the Inflammation, but the extravasated Blood occasions an Empyema. We must distinguish clearly between these two Accidents; because they require a different Cure. The Direction of the Stroke depresses the broken Pieces; if the Middle of the Rib is struck, the Pieces are pressed inwards; if the Extremities of the Ribs happen to be pressed, they may fracture in their Middle, and the Pieces will be forced outwards.

To reduce the Ends forced inwards, a strong Man is to press upon each Extremity of the Rib, in order to make the Pieces rise, to be put even; and the Patient must be obliged at the same Time to make full Inspirations, particularly to blow with Force into his Hand, as into a Horn. The Parts being reduced, very thick Compresses are to be applied upon each Extremity. That towards the Spine must be larger.

larger. The fractured Part must be covered with square Compresses more or less thick, which are not to exceed those of the Extremities: Practice is to guide the Surgeon. There are Cases where the Compresses should be simple. Lastly, they must be wet in a proper Resolvent, as Brandy, Ol. Rosar. The whole is secured by a circular Bandage, which embraces the whole Thorax by four, or five Circumvolutions, both above and below the Fracture, for greater Security. The whole may be kept on by the Napkin, and Scapulary.

If the Pieces are so forced inwards, that they cannot be pushed back outwards, an Incision below the Fracture, between the intercostal Muscles, is recommended, to give Room to introduce the Finger, and so to bring them back, and support the Rib in it's Situation. If there are Signs of an Extravasation, the Operation of the Empyema must be performed in the common Place.

But if the Ribs should be pressed at their Extremities, the Fracture is almost always near the Middle, and the Pieces will be pushed outwards. In order to replace them, the Surgeon is to situate the Patient conveniently to make the Conformation. He will know the Pieces are well reduced by sliding his Thumb over the fractured Place. The Apparatus consists in applying graduated Compresses upon the Fracture, and putting a small Piece of Paste-Board in the first Fold of the first Compress. He may likewise make Use of Compresses about five Fingers long, and an Inch broad, which are applied betwixt the broken Rib, and that next to it, another Compress being placed above to cover them. The Bandage of the Body and the Scapulary must secure the whole.

If the Pleura was inflamed, as afore-mentioned, Recourse should be had to repeated Bleeding, a moistening Regimen, Vulneraries, and to tempered Diaphoretics. Every Thing should be avoided that may render the Motions of the Respiration either too strong, or too frequent; and in order to moderate the Contractions of the Muscles, and Startings of the Pleura, it would be necessary to bind the Thorax tight, by a quilted Waistcoat, or the Napkin.

The Fractures, whose Species and Causes have been explained require sometimes the whole Attention of the Surgeon, as well upon Account of their Differences, as their Symptoms, &c.

First, if the Ribs are depressed towards the Lungs, they compress the Pleura, and even lacerate it, or produce a great Inflammation. This Depression is occasioned by a Blow, or a Fall,

a Fall; or, lastly, by a violent Compression acting upon the convex Part of the Rib.

Secondly, the Fracture of the Rib outwards can only be owing to the Pressure of it's two Extremities.

Thirdly, these two Species of Fractures vary in such a Manner that in almost all Falls, Blows, or Compressions, the Fracture remains in it's natural State, especially when only one Rib is broken.

Fourthly, the Case is not the same, where several Ribs are broken, and that at some Distance from one another, and not in the same Line, which could not easily happen on Account of the Disposition of the Ribs. It is easy to discover these Fractures, notwithstanding the present or ensuing Symptoms. The Emphysema is the most common.

Fifthly, although the Fracture commonly happens near the Middle of the Convexity, always tending more towards the Spine approaching the Angle that each makes separately, they may be fractured at their anterior Parts, at some Inches Distance from the Cartilages, that unite them to the Sternum.

Sixthly, in whatever Manner the Fracture happens, whether the Rib be forced inwards, or outwards, it is transverse, a little oblique in certain Cases; in others with Splinters without much Separation, and the Asperities are less obvious than might be imagined. The same Rib may likewise be fractured in two Places.

Seventhly, though the broken Rib be forced inwards, or outwards, the exterior Table appears to be first fractured, and the second not 'till after, and at some Lines Distance. Which is the Reason that when we slide the Thumb along the Rib to be assured of the Fracture, no Inequalities are felt; but what discovers it to the Surgeon is the different Motions of the Patient, whether he bends, or raises himself up; lastly, whether he inclines upon the opposite, or upon the same Side. Then he feels the Fracture by the Collision of the Pieces against one another.

People have been frequently known to complain of a Pain of the Side, of a slight Difficulty of breathing, and of being incapable of certain Motions to keep up a free Respiration. That is the Case when the Rib is fractured even, and the two Ends are replaced instantly; or else when the external Table fractures first, and the Pieces rejoin, as if they entered into one another. An Idea may be formed of what happens in that Case, by breaking one Switch of flexible, and another of dry Wood, to see their Differences.

OBSERVATION I.

A Tradesman of Paris, in falling, fractured one of the true Ribs; but the Fracture could not be discovered. In order to ease him, the Bandage of the Body was applied, he got on Horse-back to ride eight or ten Leagues from the City, and did not return till eight Days after. The Exercise he underwent during that Time, by the Motion of the Horse, prevented the Re-union. What ascertained the Fracture was that, the Patient being seated, and turning himself a little in a straight Line upon the opposite Side of the Fracture, a slight Noise was heard, which was made at twice; the first in turning, and the second in restoring himself. It was impossible nevertheless to distinguish the real fractured Place with the Thumb; but, as it was no longer doubled, the proper Dressings were applied, the Patient kept in Bed, and was perfectly cured.

OBSERVATION II.

A Painter was thrown down backwards by a Cart, the Wheel passed over the whole right Side of the Thorax. He became insensible, and immediately spitted Blood, which was equally discharged by the Nose. He was carried Home, and quickly assisted. The Surgeon desired to be aided by one of his Brethren. The Patient was carefully examined, and being laid flat upon his Back unable to move, the Clavicle was perceived to be fractured, as also all the true Ribs, and the first spurious one. The State of the Patient would not permit the Application of a proper Dressing. They contented themselves therefore with applying a moderately hard Pillow under the Shoulder to remove the Arm from the Trunk; so that the broken Pieces of the Clavicle might be kept close; several Napkins doubled were applied along the Ribs on the left Side, and Compresses dipt in the common Defensive upon the fractured Ribs; the whole secured by two good circular Napkins. The Patient was bled eight or nine times in twenty-four Hours, which prevented the Symptoms. Then they tried to raise him up to reduce the Clavicle with the proper Bandage, and apply the Dressings for the Ribs; but he could only lye upon his Back. It was consequently necessary to replace the Pillow betwixt the Shoulders, to prevent the Pieces of the Clavicle from changing Place. The graduated Napkins were placed upon the sound Side to make a Point of Support, which hindered the fractured Ribs from being forced inwards by the Dressings; the Freedom of Respiration was very much streightened at Intervals by the Situation

tuation of the Patient, as there was a Tension of the Abdomen. This Symptom was remedied by placing a Sheet, made into a Roller, under the Patient's Hams. The Knees being bent, the abdominal Muscles, but particularly the Recti, were gradually relaxed, which relieved him greatly. He was left in this Posture near three Weeks, and when he appeared to be better, he was placed as usually, and was cured.

OBSERVATION III.

TO shew that the Fractures of the Ribs are such as have been described, I will relate the following Instance. A certain Person, being desirous to stop a Coach, was thrown upon the Ground, and the Wheels passed over all the right Side of the Thorax, and Abdomen. The chief Cause of his Death was easily discovered, as the whole Cavity of the Abdomen was found filled with Blood proceeding from a Laceration of the Liver in several Pieces, and the Stomach opened. After which the Ribs were examined; the Disorder was so great, that the five first true, and the three last false were fractured, some towards the Middle, others more forwards; and lastly one and the same Rib was broken in two Places. Some of these Fractures were transverse, oblique, and others with Splinters. The Coach Wheels were the Cause, consequently the Pressure was from without inwards, nevertheless they kept in their natural State, and were not depressed, except when pressed upon by the Thumb.

It is not difficult to explain this Phenomenon. Nothing tends to draw the Ribs inwards. They are all attached to one another by the intercostal Muscles, that they may not separate too much, and the whole external Part of the Thorax is covered with strong Muscles, which draw them outwards, or at least oppose their Depression, &c.

The Callus that forms in the Fractures of the Ribs, generally forces more inwards than outwards, which is the Reason that after the Cure, it is difficult to distinguish the fractured Place; which may proceed from the external Plate rising over the internal. The Periosteum is likewise thicker there, and the Muscles covering the Ribs check the Effusion of the glutinous Juice.

The Lues Venerea, the Scurvy, or scrofulous Humours, may occasion a swelling of some Parts of the Ribs, but especially the Disease called the Rickets. These Disorders, as also a Caries, require a particular Treatment. Its Causes may be those above mentioned, and sometimes it is the Consequence of an Empyema, or a Collection of Matter,

or Abscess in the Pleura, whose Pus will become corrosive by it's Stay; a Fistula generally attends this Disease, and the Patient most frequently perishes.

If the Caries is occasioned by external Causes, it is owing to a Blow, or Fall. We include in Blows Gun-shot. Blows may produce it in two Cases, viz. when by a Thrust an Instrument penetrates the Rib, and splits it without fracturing it totally. Sometimes even the Point may remain in it.

The second may be produced by a Contusion of the Periosteum, which will gradually separate from the Surface of the Rib. Then the Liquor transuding from the Extremities of the Vessels, particularly the Lymphatics, will by it's Lodgment become acrimonious, which will destroy the bony Fibres. The Patient in these Circumstances only feels a dull Pain, and afterwards the Caries shows itself by a Collection of Matter. These Diseases are very frequently succeeded by a Fistula, even when Remedies are early applied; but the Patient may live; whereas in other Circumstances the Caries goes on, a Fracture happens, and the Patient dies.

OBSERVATION IV.

A Woman of St. Denis was stabbed by a Knife. The Point remained in the Rib. She was treated without any Regard to the extraneous Body. Three or four Months after, a Tumor appeared, which was opened. They were surprized to find the Rib carious. It was necessary to procure it's Exfoliation; but, as the Collection of Matter seemed to come from the Cavity, and as a great deal of Pus was discharged from Time to Time, the Ends of the carious Rib were advised to be cut off. The Wound remained fistulous, and the Patient has continued in that State for several Years without much Inconvenience.

OBSERVATION V.

A Contusion produces the same Effect. A Quarrier, sixteen or seventeen Years of Age, was squeezed betwixt two Stones, as he was working in the Quarry. The Fracture could not be found out at the Examination. They were contented with bleeding him, and applying proper Compresses upon the Contusion for some Days; which enabled him to work. More than six Months after, a little hard Tumor appeared externally, which was believed to be of the strumous Kind. A small Plaister was applied, and he continued to work without much Pain. A Year after, he complained heavily, and kept his Bed, the Fever came on, and he died in a short Time. His
Body

Body was opened, and two Ribs were found carious, and another where the Caries had begun internally. It had excavated two Thirds in the Form of a Groove, there only remained the Superficies of the external Plate.

ARTICLE VII.

Of the Fracture of the Bones composing the Pelvis.

THESE Bones are two in Number, the one on the right, and the other on the left Side. They are of great Extent, of an irregular Figure, very thin in the Middle of their Bodies, very thick, and spongy, at their Circumference. In young Subjects they are divided into three. The first, which is the largest, is called Os Ilium. The Breeches Waist-band, and likewise the Bandage for Hernias, press upon it. The second is called Os Pubis; it occupies the anterior Part, and is less elevated. The third, which is provided with a Tuberosity upon which we sit, is called Ischium. These different Pieces are united by Cartilages to the Age of twenty, or thereabouts. They have a large Cavity at their Junction, to receive the Head of the Femur. They are sustained posteriorly by the Os Sacrum.

These Bones, although provided with strong Muscles, are not exempt from being fractured in different Parts of their Bodies, either by Falls, Blows, or Pressure. The Os Ilium is the most exposed on Account of the Sweep of it's Spine. These Fractures may be longitudinal, transverse, oblique, and lastly with or without Splinters.

It is difficult in general to discover these Species of Fractures in fat People, and even in those that are not so, especially when it is of the Ischium, or Pubis. The Fracture of the Os Ilium is more easy to be found out, because it presents a greater Surface, is elevated, and it's superior Part projects outwards.

The Fracture of the Os Ilium, when transverse, should, one would think, sufficiently notify it's own Reality; because according to all Rules, the superior Portion ought to be separated from the inferior, nevertheless that never happens; because it's whole internal Surface is occupied by the Iliacus, and it's external Part is covered by the Glutæi, which hinder the Separation, particularly the Maximus, and Medius with the Portion of the Aponeurosis of the Fascia lata which is attached along the anterior external Labrum. The Gracilis may likewise oppose it. As to the abdominal Muscles, though they are inserted into almost the whole superior Circumference of that Bone, they cannot overcome the Resistance of the other Muscles.

When

BONES COMPOSING THE PELVIS. III

When a Fracture is suspected, the Touch is the most certain Way of trying, to hear the Crepitation, if possible. The Patient may also be placed upon the sound Side, the Breast and Belly inclining forwards, and the Thighs bent. This Situation occasions all the Parts to relax, which gives full Liberty of thereby coming at the Certainty of the Disease, whereas when the Patient is laid upon his Back, all the Muscles, even the Abdominal, are extended.

The fractured Part is most frequently very much swelled, as also the adjoining Parts; therefore, whatever Motions are made, it would be impossible to discover the Fracture. There is besides an Obstacle which prevents it, viz. the Emphysema in the Bodies of the Glutæi. That may deceive, as a Trembling more or less sensible is felt by compressing with the Fingers, which might induce one to believe that two Bodies rubbed against each other.

As it is difficult to come at the Certainty of the Fracture of these Bones, Reference must be had to the Symptoms happening at the Instant of the Blow, or Fall. The Patient entirely loses the Motion of Progression, there is sometimes so great a Retention of the Urine, that it is absolutely necessary to introduce the Catheter, and leave it in the Bladder. In other Cases the Urine is discharged involuntarily, as also the Fæces; which is owing to a Paralysis of these Viscera. The Patient cannot lay upon his Back, he must be half set in his Bed. Some Days after the Fever comes on, the Legs, and Thighs, become more or less oedematous, and the Gangrene shows itself. In such a Case the Disease becomes mortal, tho' the Patient does not suffer great Pains.

The Fracture of the Os Pubis, and Ischium, is accompanied with the same Symptoms; but there are others that are worse. The frequent Vomiting, to which the Patient is subject, fatigues him greatly. The Matter that he vomits is of different Colours; the most to be dreaded is that which he ejects in Lumps, and of a blackish Colour; the Hickup, Convulsions, Startings, torment him grievously. The Pains are violent, and acute, the whole accompanied with Watching. These Symptoms end in Death.

The Prognostic of these Species of Fractures must be very bad, as all who have treated them own, that they are mortal. What is melancholy for the Patient, is that after having suffered some Time, a Collection of Matter, or Abscess forms in the Body of the Iliacus, or in the adjacent Parts of the Pelvis, which cannot be remedied, as it is not known 'till after Death, and by opening the Body.

OBSERVATION I.

AN Artificer who wore a Steel Truss, fell upon his Side from a very high Place, and broke it. He scarcely felt himself hurt at the Instant, except that he could not walk. He was carried to the Hotel-Dieu, where no Fracture was found in any Part of his Body. He was wrapt up in Sheep Skins, which relieved him very little. His Urine was suppressed; a large Contusion, with Ecchymosis appeared, that occupied the whole Side upon which he fell; the Leg, and Thigh were motionless. The Swelling and Tension of these Parts occasioned a Belief, that the Thigh was luxated, which Accident could not be ascertained, any more than the Fracture of the Os Ilium. The Patient was treated with Care, but in the End unsuccessfully, as he died the fourteenth Day from his Fall. I was at the Opening of the Body. The Pelvis was quite full of Pus; the Iliacus, and Psoas, totally lacerated, and the Os Ilium fractured transversely, though the Pieces had not changed Place.

OBSERVATION II.

A Quarrier living at Arcueil, could not follow his Work, unless he laid flat upon his Back. A massy Stone fell upon the Hypogastric Region, he was assisted, and put into his Bed. The Surgeon bled him, and applied Embrocations upon the whole Abdomen, and he had Recourse to emollient Herbs to relax the Tension of the Parts. The Patient had no Use of his Thighs. He was not at Ease, unless half set. He had a Suppression of Urine, and Feces. He was founded, and Clysters were given him. All these Symptoms continued, notwithstanding the repeated Bleedings. The Motions the Surgeon made to the Thighs separately, assured him that the Head of the Femur was very free every where in it's Cavity, and that there was an uncommon Motion towards the Symphysis. He repeated the Bleeding, and left the Catheter in the Bladder.

The Symptoms were so obstinate, that I was called in. Upon the Surgeon's Report of the State of the Patient, we were certain of the Fracture of the Ossa Pubis, without being able to distinguish by the Touch, whether the Pieces were thrown out. The Fever, which never left the Patient, obliged him to be bled again. Every Thing was done that was thought necessary to secure the Pelvis by a Bandage,

and

and the Situation he was put in. He continued about a Month, and died.

A Disease of that Consequence was well worth a special Enquiry into it's Cause. After all the Parts covering the *Ossa Pubis*, were removed, they were found divided into four Pieces. They were only sustained by the Symphysis, by the *Obturator*s, and by the resting of the Heads of the *Femur* upon the Portion of the fractured Cavity. There were many Muscles lacerated, and a great Quantity of coagulated Blood.

OBSERVATION III.

A Parisian, desirous to stop a Coach, was thrown upon the Ground by the Horses, and the fore Wheel bruised him upon one Side, whilst on the other he was squeezed against a Post. He could not raise himself up. He was obliged to be carried Home, and the Bones of the Pelvis were not discovered to be broken. Nevertheless he remained in Bed unable to move, laid upon his Back, with his Extremities extended, and very full of Pain. The Urine was suppressed, so that he was obliged to suffer the Catheter in his Bladder near fifteen Days. He was bled ten or twelve Times, though of a very delicate Constitution. He was treated with all possible Attention, by Means of Embrocations, Fomentations, and in short, in every Respect suitably to his Case. Though he had no Fracture, he kept his Bed near six Weeks, and was not able to walk for some Time, except with Crutches. This Observation shows how proper it is to neglect nothing in Falls of this Kind.

It is rare, not to say impossible, to be perfectly sure of the reality of the Fractures of the Bones of the Pelvis, particularly when they happen to the *Os Pubis*, and *Ischium*. We do not speak of those owing to Gun Shot, where the Solution of Continuity renders the Fracture sensible to the Touch. As to the Manner of reducing the broken Bones, the Patient is to be seated upon a Bed, that the Femoral Muscles may not be extended, the Head, and Breast, must be inclined forwards, he is to be held steady, and his Body turned to the Right and Left, the Thumbs are to be applied upon the Place, where the Fracture is suspected. This Situation is the best to ascertain that of the *Os Ilium*.

If it is for that of the *Pubis*, the Patient must be laid upon his Back, with his Legs, and Thighs bent.

For the Fracture of the *Ischium*, the Body must be placed upon the Side.

The most proper Bandage, and Apparatus for these Sorts of Fractures, consist in applying several Compresses wet in a Defensive, a PASTE-BOARD above, and the Whole secured by a large Napkin. Some prefer the Spica; but, as the Patient must be raised to make the Circumvolutions of the Band, that may augment the Symptoms. Care must be taken to place him commodiously in his Bed, to bleed him as much as shall be judged necessary, to make him observe an exact Regimen, and regard must likewise be had to the Course of the Urine.

C H A P. VII.

Of the Fractures of the superior Extremities.

A R T I C L E I.

Of the Fracture of the Arm.

THE Arm is composed of one Bone, named Humerus, cylindrical between its Extremities, which is called it's Body. It is more or less bulky, according to Age, Constitution, and Sex, and hollow internally in Form of a Canal, to contain the Marrow in Substance; which losing it's balsamic Quality, sometimes causes Fractures from an internal Cause.

The whole external Part of the Bone is not even, it is marked with Lines, Unevennesses, and Surfaces. At it's superior Parts is a half spherical Head incruited with a Cartilage, which is received into the Cavity of the Scapula by Arthrodia, or Enarthrosis. This Articulation permits it to move in every Direction.

Its inferior Extremity has no Motion, for Flexion, and Extension, performed upon it, belong to the fore Arm.

The Humerus is divided into three Parts, it's Body and Extremities. It has many Muscles, Vessels, and Nerves, whose Situation, and particularly the Course of the Vessels, ought to be known.

This Description of the Structure of the Arm shows that Impressions by Blows, or Falls, may fracture it in every Part.

The

The Humerus is most exposed to a transverse Fracture; nevertheless some are oblique, others with Splinters, and lastly, others where the Bone is, in a Manner, ground to Powder, which depends upon the Cause.

When the Arm is fractured, it is immoveable. It appears at first Sight to be in a State entirely different from the natural. It is more or less swelled at the broken Place; the fore Arm, and Hand cannot act; their Situation is changed, which is owing to the Species of Fracture, and Distance of the separated Pieces.

When the Fracture is transverse, and both Ends remain in Place, the Arm is as long as the sound one, and the Tension is trifling, but the Patient cannot move it. To find out this Fracture, the Surgeon holds the superior Part of the Arm firm with one Hand, and embraces the inferior with the other, which he moves; then he assures himself of the Fracture and remedies it.

The Fracture with Displacement happens in two Ways; for a Portion of the Bone may be thrown out in half of its Thickness, or else totally, which is, either forwards, or backwards, or laterally; this depends upon the Blow, Fall, the Attitude the Patient was in, or lastly upon the Assistants, who may move it.

The greater Distance the Fracture is from the Center of the Bone, that is, the nearer it is to the Joint, the greater will be the Action of the Extensors, and Flexors in drawing the inferior Piece upon the superior. The Bone which has lost it's Continuity, no longer makes any Resistance, therefore the most moveable Part, which is the inferior, must necessarily be drawn upwards according to it's Position, which is evident by the Shortening of the Arm. If the Fracture is oblique, the superior Portion more easily gets upon the inferior.

As to the two other Species of Fractures, viz. that with Splinters, and that where the Bone is shivered to Pieces, they should be treated differently to prevent the Symptoms.

The Fracture near the Joint of either Extremity varies, as well on Account of the Structure of the Part, as of the different Motions, and Symptoms.

That of the upper Part below the Head, viz. towards the Neck, or below the Deltoid, requires great Attention, and a particular Treatment. The attending Symptoms, and those necessary to be prevented, are always to be dreaded, especially when it is owing to Gun-Shot. It is so bad in this Case,

that the Masters of the Art do not long defer Amputation in the Joint.

Some attending to the Contusion, Ecchymosis, and Swelling, make Incisions to relax, and diminish the Symptoms, which may be caused as well by the Ossific Juices, as by those of the soft Parts; but, the Symptoms continuing notwithstanding this Assistance, they do not hesitate to extirpate.

A Fall, or bruising Blow, may occasion such a Species of Fracture, as will be instantly succeeded by Tension, and Swelling with Contusion, which increases the Difficulty of discovering it, upon Account of the Contraction of the Deltoid Muscle, and of those attached to the Circumference of the Humerus, which keep the Bone confined in the Cavity of the Scapula.

These Obstacles will not let us presently determine, whether the Bone is broken, or luxated. In this Doubt, it is necessary to temporize, and not torment the Arm by various useless Motions. On the contrary, it is prudent in the Surgeon to lay the Patient down, to place the injured Part properly, to bleed him according to his Strength, and apply Embrocations, and Topics proper to calm, and diminish the Symptoms. Care is to be had, that these Remedies be not too hot. They must be mild, emollient, and resolvent.

The Symptoms being over, the Surgeon assures himself of the State of the Disease by placing the Patient commodiously, either in Bed, or upon a Chair, whilst he is held by an Assistant, who rests one Hand upon the anterior superior Part of the Scapula, to fix, and keep it in Situation; a second Assistant supports the Hand, and fore Arm bent in a right Angle. The Parts being thus secured; the Motions the Surgeon judges proper to make to the Part lead him to the Disease. If it is a Fracture, the Crepitation is manifest, if it is a Luxation, the Head out of the Cavity shews it, even by the Change obvious in the Joint. Nevertheless we may be deceived, for the Deltoid may in a Fracture, by its Contraction, keep the broken Part in such Subjection, that it is very difficult to be assured of it.

The Fracture of the inferior Extremity of the Arm near the Joint must be treated with Care, the Symptoms are always to be feared, as well upon Account of the great Number of Muscles, Tendons, Aponeuroses, as of Vessels of every Kind. Such a Fracture, is generally different from that of the superior Part, because the Humerus is not round in this Part, but flattened both before and behind, and it is terminated by two Eminences called Condyles.

As these Parts are compact, a Shor divides them with Splinters, and sometimes obliquely. Cases are met with, where only half of the Bone is separated, whilst the other Portion remains intire. If the Fracture is with a Wound, it is necessary to attend to the Discharge of the Synovia, as it may render the Joint fistulous.

Fractures occasioned by Fire-Arms, always require Incision to prevent the Symptoms. If they are unsuccessful, Amputation is indispensable.

The Prognostic of the Fractures of the Arm is taken from their Species, Situation, Largeness, the present Symptoms, and those to be apprehended. The Surgeon should not hesitate to forewarn, that an Ankylosis of the Joint will succeed a Cure, notwithstanding all his Care.

Whether the Fracture be near the Joint, or elsewhere, the Cure consists in the Conformation, and Application of Dressings proper to each Species. If the Fracture is simple, or composed, a circular Bandage will be sufficient; but the compound requires the eighteen tailed one.

When the Neck of the Humerus is fractured, though the Symptoms appear at first moderate, the eighteen tailed Bandage ought to be preferred, and it should be treated as a compound Fracture, not only upon Account of the Tendons, and Muscles, but also by Reason of the Difficulty of securing the Pieces properly. A rolled Bandage cannot be used, because the Globe of the Band cannot pass easily under the Axilla, unless we raise the Arm, and oblige it to move, which might displace the Fracture.

If the Fracture is near the Olecranon, the eighteen tailed Bandage is also to be used, in order to prevent the Symptoms, and Ankylosis.

The Apparatus for the simple, and compound Fracture is the same that has been mentioned. The Pieces, composing it, consist first, of a Compress slit at one, or both Ends, to surround the fractured Place; secondly, of two Bands two or three Fingers broad, and each three Ells long; thirdly, of three moderately thick Compresses of old Linnen. Fourthly, some Practitioners make Use of Splints of the same Length, and Breadth as the Compresses, and rounded at their Extremities; they are made of very thin Wood, or Palle-Board. They are put between the Folds of the Compresses. Fifthly, a Band like the first is necessary. Sixthly, two Paste Boards proportioned to the Bulk of the Part, and Apparatus, rounded, and notched at their Extremities; Seventhly, three Pieces of Tape; Eighthly, a Napkin for the Sling. It is sometimes necessary

cessary to make the Patient keep his Bed, then his Arm must be laid upon a Pillow, the Fore-Arm, and Hand a little raised, to facilitate the Return of the Fluids.

All the necessary Pieces of the Apparatus being placed in order in a Dish, or such like Thing, the Surgeon sets about making the Conformation. To effect which, the Patient's Arm must be removed from the Breast, the Fore-Arm bent, and raised until the Arm makes a right Angle with the Body. Then an Assistant embraces the superior Part of the Arm with both his Hands, which he holds firm; another does the same at the inferior above the Condyles, and a third supports the Hand, and Fore-Arm. The Assistants being thus placed, the Surgeon informs himself whether the Ends of the broken Bones are even. In Case they are, no Extension is necessary; it is sufficient to keep the Pieces in Situation, and apply the Apparatus and Bandage, with proper Care, not to bind too tight.

If the inferior fractured Piece is displaced in it's whole Thickness, and has got up to the Side of the other, which is easily known, the Assistant who holds the superior Part of the Arm, must be firm, and steady, and he at the inferior must pull towards him with a moderate Force, and by Degrees, in order to bring back the Pieces, and to make the soft Parts yield gradually. This Motion of Extension must be directed by the Surgeon, who, with his Fingers, or the Palm of his Hands, feels the Progress of the Piece. Then he orders it to be increased, or diminished, that he may bring the Ends into Apposition.

As to the oblique Fracture, the Extension and Counter-Extension must be greater or less, which depends upon the Situation of the inferior Piece, that has slipped over the superior. It is also prudent in the Surgeon to have an Eye to it. The Bandage is the same as for the transverse Fracture.

The Apparatus is to be applied in the following Manner: The same Assistants must hold the Arm, and Fore-Arm in the same Situation they were in during the Extension and Counter-Extension. Then the Surgeon takes the Compress slit at one or both Ends, that is to surround the Fracture; after having wet it in a Defensive, he applies one End precisely upon the Fracture, and raises up the other: Then he takes a Band, and makes three Circulars upon the Fracture. They must be applied even, and only as tight as is necessary to secure the broken Pieces. After which he is to proceed by Spirals to the superior Part of the Arm. If the Band is longer, it is proper to descend, and fasten it where it ends.

He must likewise make three Circulars upon the Fracture with

with the second Band, and descend by Spirals to the very Condyles, in order to pass from thence below the Joint, without incommoding it. The Band is finished by Circulars round the superior Part of the Fore-Arm.

Then he applies three moderately thick Compresses, as long as the Patient's Arm. They must be at a little Distance from one another. As they are not to be applied upon the Course of the large Vessels, hence they are limited to three, though some Practitioners recommend four.

If the Fracture is composed, viz. if the Humerus is broken in two Places, it is proper to put the Splints betwixt the first Folds of the Compresses, or upon them, they will serve to keep the divided Pieces together. I have spoken of them before. They are to be secured by a Band two or three Fingers broad, and about three Ells long. The first Circulars must be made upon the most moveable Part of the Fracture; then the Band is to be carried to the superior Part of the Arm by obtuse Circulars, and brought back to terminate, if possible, above the Condyles, or however below the Joint.

Over the Band are applied two Paste-Boards, whose Length must be taken upon the sound Arm. Their Extremities ought to be notched, and rounded. They are to surround the whole Apparatus without touching each other, and that they may mould themselves to the whole Arm; they should be wet in a Defensive, or in warm Water. When they become dry, they secure all the Band, and Compresses. These Paste-Boards must be tied by three or four Pieces of Tape, two Fingers broad, Care being taken to begin always at the Middle, for the greater Security, and then at either Extremity.

The Apparatus being applied, the Arm is lowered in order to be brought near the Breast: It is supported at the same Time by the Sling. But, as all Fractures require Repose, as well for the Formation of the Callus, as on Account of the Circulation, it is more proper that the Patient lie in Bed at first, and that the Arm, Fore-Arm, and Hand, be placed upon a large Pillow, and higher than the Arm, to favour the Return of the venous Blood, as we have already mentioned in speaking of the Particulars of the Apparatus.

The Patient at the End of fifteen Days will be able to get up, and then make Use of the Sling. If he should grow weary of Bed, he is to be relieved by being taken up; but the diseased Arm inclosed in the Pillow is to be supported, and placed upon a Table.

The Reasons that have been given to show that the eighteen tailed Bandage is preferable for a Fracture near the Neck of the

Humerus, are more than sufficient to enforce it's Use; nevertheless it should be observed, that it is not to be composed of the same Number of Pieces, as in the other Fractures, that require it.

To treat this Fracture methodically, the Patient being seated commodiously, a large Napkin must be passed round his Body, which is given an Assistant to hold. The Arm is to be raised, and extended in a straight, and horizontal Line. Another Assistant having embraced it above the Elbow; the Surgeon is to order the first to hold the Napkin firm, whilst the other draws towards himself. At this Time the Pieces must be reduced, as much as possible. The Arm is generally very much swelled. A simple Compress is applied to surround the whole Joint, and superior Part of the Arm. It is first necessary to place a square Compress, two Fingers thick, and four long, in the Hollow of the Axilla, that the simple Compress may press equally every-where. After which are taken three longitudinal Compresses, of a proper Length and Thickness; the first must be placed by it's Middle in the Hollow of the Axilla, and one End is to be carried anteriorly upon the Acromion. Another must be placed posteriorly upon the Neck of the Scapula, to cross upon the first. The second Compress is to be laid at the Side of the first, to embrace the Head of the Humerus. It's Extremities are to be crossed at the same Place as the first. The third should turn upon the Fracture. The eighteen tailed Bandage must be placed upon them. The Ends are to be crossed obliquely upon one another; and two other longitudinal Compresses, not so thick, must be applied, to envelope the rest of the Arm.

The Parts thus kept together by the Bandage, the Patient is to be laid in Bed, the Arm in the same Situation, and surrounded with a large Pillow, or a Sheet folded in several Doubles, as above mentioned.

If this Posture is irksome to him, the Fore-Arm is bent to relax the Muscles. When the Swelling is diminished, it will be necessary to remove the Apparatus in order to tighten it, and thereby prevent the Pieces from being displaced. Besides, it is necessary to prevent an Extravasation of the ossific Juices. The Situation of the Patient may be changed to ease him.

Some Days after, in order to prevent the Ankylosis, we are to move the Head of the Humerus gently in it's Cavity, by raising up the Pillow, or Sheet it is laid in.

When we think the Callus is begun to harden, the Arm must be brought gradually near the Body, which is to be daily repeated, 'till it comes to it's natural Situation. Then the Patient

tient must be careful to move it gently, to divide the Synovia. By those Precautions he will escape Lameness.

If the inferior Part of the Arm is fractured, and it be necessary to employ the eighteen tailed Bandage; Care must be taken to keep this Part in a quite contrary Situation to that of the superior; viz. in applying the Bandage the Fore-Arm must be bent in an obtuse Angle. As for the necessary Particulars, they only consist in a simple Compress over the eighteen tailed Bandage. The Hand, and Fore-Arm are to be raised higher than the Fracture, to give the Fluids a free Course, as before mentioned.

ARTICLE II.

Of the Fracture of the Fore-Arm.

ALthough the Fore-Arm, like the Leg, be composed of two Bones; the operative Part of the Fractures of these two Parts is very different, either in Respect to the Size of the Bones, their Situation, Articulations, Motions, the Manner of reducing them, or lastly relatively to the Particulars proper for them.

The Ulna and Radius are situated at the Side of each other. They are joined by their superior, and inferior Extremities; but between their Bodies they leave a Space, which depends upon their being more or less bent. The same Thing is remarked in the Leg. This Vacancy is occupied by a Membrane which has been considered as ligamentous; nevertheless it's Structure is aponeurotic by the Direction of the Course of the tendinous Fibres.

The Tibia is large, the Fibula small, the Articulation of the first is obvious, and that of the last very obscure. The Ulna and Radius have the same Motion as the Leg, but is more complex, and the Radius has two peculiar to it, viz. Pronation and Supination, consequently it's Articulation is different from that of the Fibula.

The Radius has two Muscles proper to execute these Motions, the Knowledge of which is necessary in Fractures, for they displace the Pieces; the Fibula has none, and for that Reason, though it be fractured, it remains in Situation in many Cases.

The Ulna, according to some Authors, is placed internally, and the Radius externally, in which they resemble the Bones of the Leg. This Situation appears such in a forced Supination, or in a Fore-Arm stript of the Flesh; but a careful Examination of the true Situation of these two Bones shew us, that
the

the Ulna is placed posteriorly, and the Radius anteriorly. This Knowledge of Situation is of Importance in order to the Reduction of the Fractures that may happen to them; for to succeed therein, the Fore-Arm must be so placed, that it be neither prone, nor supine, as well to keep the Bones in Situation, as to apply the Apparatus, and prevent the Fore-Arm from being incommoded.

The superior Part of the Ulna is very large. An Eminence called Olecranon rises from it's posterior Part. It is liable to be fractured transversely, like the Rotula, &c. It's inferior Part is slender. The Radius is shorter than the Ulna, it's superior Part is small, and the inferior is very large.

These Bones may be broken separately, both together, and in different Places.

In the Fracture of the Radius we are to remember it's particular Articulations, which permit it to turn upon the Ulna in executing the Motions of Pronation, and Supination. It is necessary to endeavour, if possible, to preserve the Freedom of these Motions, which is frequently difficult, notwithstanding the greatest Care.

When both Bones of the Fore-Arm are broken, this Fracture may be called compleat; and when only one, incompleat. Although this Distinction seems appropriated to Fractures of the Cranium, nevertheless there is no Reason against it's being admitted here. When one Bone is fractured in two Places, it must be called a compos'd Fracture.

These Bones are seldom fractured in one Way. Therefore we distinguish transverse Fractures from oblique; those with Splinters without Displacement, from the compound with Displacement: Lastly, they vary according to their Situation, as the Fracture near the Joint is always more dangerous than in the Body of the Bone.

The Signs shewing the Fore-Arm to be fractured, are the Loss of Motion, the Swelling, Tension, and Change of the Part. If both Bones are broken, there will be a Bump at the fractured Place, and the Fore-Arm is generally shorter, and the Hand totally turned inwards.

If the Ulna alone is fractured, the Patient is deprived of the Motion of Flexion, unless it be at it's inferior Part, in which Case he can support the broken Place with the other Hand; and as the Arm is the Support of the Fore-Arm, the Motion may be thus performed. People have been seen to have the Ulna fractured, and yet perform Flexion, and Extension by the violent Tension of the Aponeurosis, that covers it's posterior Part, which is not provided with Muscles.

When

When the Radius alone is fractured, the Patient may perform Flexion, and Extension by the Support that the Ulna receives from the Arm, and as it cannot be moved by the Muscles peculiar to it, on Account of the Division of it's Continuity, it is deprived of Pronation, and Supination. The Fracture of the Radius is sometimes difficult to be discovered, by Reason of the great Number of Muscles that surround it, and the fractured Pieces are always forced and drawn towards the Ulna, as well by the Contraction of the Pronator Teres, and Quadratus, as by the Aponeurosis that unites both Bones.

As to the Situation of Fractures, it may vary, as both Bones may be broken, at their superior, and inferior Parts; or, lastly, in any other Part of their Body. The same Difference may happen to one Bone.

The Fracture of both Bones near the Joint of the Arm, though simple, is very dangerous; but the compound is more so, and we are frequently obliged to take off the Limb; that of the inferior Part near the Wrist is less to be feared.

When the Olecranon is broken transversely, the upper Portion is separated from the lower by the Contraction of the Extensor Muscles. This Fracture resembles that of the Rotula; but it most frequently produces an Ankylosis of the Joint, which is seldom the Case with the Rotula.

The Causes of the above mentioned Fractures are the same as those related elsewhere.

Both Bones of the Fore-Arm cannot be fractured, but the inferior Pieces must change Place, either breadthwise, or lengthwise. The superior Portions are less liable thereto. That of the Ulna by it's Articulation with the Arm resists; in like Manner does that of the Radius, by it's strict Connexion with the Ulna by Means of Ligaments, and the Supinator brevis, which surrounds a great Part of it's Head; nevertheless the Tendon of the Biceps may displace it.

It is not the same with the inferior Parts, there is scarcely any Resistance, they are moveable; consequently the Action of the Muscles of the Wrist, rather than act upon the Wrist itself, obliges the inferior Part of the Fore-Arm to rise over the superior, either anteriorly, or posteriorly. The Supinator longus may contribute to the Displacement. If the Bones are fractured unevenly, the Pieces will be slightly displaced in their Thickness; but if the Fracture is even, they may be displaced in their whole Thickness. Then there will be an Eminence in this Place, and a Depression on the opposite Side, which is easily known by the Touch, and the Motion that occasions the Crepitation. These Species of Fractures may

may nevertheless happen, and yet the Pieces be no-way displaced.

The simple Fracture of the Ulna cannot be known but by moving the Fore-Arm differently; viz. we hold the superior Part firm with one Hand, and move the inferior with the other in an opposite Direction to it's Situation. The Swelling that seizes upon the Part, hinders any Thing being known by the Touch, which is notwithstanding the surest Method; however it is ascertained by the Crepitation, or by a slight Shaking that is felt in the Hands of the Surgeon. This also depends upon the fractured Place.

The Fracture of the Radius is more difficult to be found out, as already remarked, than that of the Ulna, upon Account of the great Number of surrounding Muscles, and the Support it receives from the Ulna; nevertheless it may be ascertained by holding the upper Part firm, whilst the lower Part near the Wrist is embraced with the other Hand, and the Motions of Pronation, and Supination are made. As the superior Part of the Radius is immovable; the inferior Portion that is moved, either inwards, or outwards, must necessarily rub against the superior, and make some Noise. If nothing can be discovered by these Motions, it is necessary to press strongly upon the Extremity of the Radius, keeping the Fore-Arm in such a Situation, that it be neither in Pronation, nor Supination; then the inferior Piece, which may be depressed towards the Ulna by the Contraction of the Pronator Quadratus, and Fibres of the interosseous Ligament, will be obliged to rise, which produces a Kind of Crepitation.

But if on the contrary, after Trial of all these different Motions, the Bone resists every-where, we ought not to suspect a Fracture, but a violent Contusion of all the soft Parts, which by this Accident are deprived of their Functions.

When both Bones of the Fore-Arm are fractured, we are carefully to observe whether the Pieces are displaced, length-wise, or breadth-wise, or in Part; or lastly, whether they have preserved their natural Situation.

The Bones being displaced in such a Case are to be replaced by Extension, and Counter-Extension, which is performed by two Assistants, one of whom embraces the upper Part of the Fore-Arm, and the other the inferior. To succeed therein, the Fore-Arm must be so placed that it be neither prone nor supine. The inferior Pieces being brought back, the Surgeon rests the Palms of his Hands, the one internally, and the other externally, upon the fractured Place, to make the Conformation; and, while the Assistants hold the Fore-Arm in this Situation,

tuation, which is the most proper, and least irksome to the Patient, he applies the Apparatus and Bandage.

If the Ulna alone is fractured, the inferior Piece is almost always drawn against the Radius by the interosseous Ligament, and Contraction of the Pronator Quadratus, which is occasioned by the Loss of Resistance of that Bone; and especially when the Fracture is at some Distance from the inferior Part. In this Case the Reduction is effected in the same Manner as before described, observing only that, in order to remove the Portion of Bone resting upon the Radius, and reduce it, the Wrist is to be raised in a straight Line from below upwards.

If on the contrary the Radius is fractured near it's Middle, or lower Part, the inferior Piece is commonly depressed towards the Ulna by the Action of the Pronator Quadratus. Then we must only think of getting it under, and counterbalancing it, by keeping the Hand in a middle Situation between Pronation, and Supination; for, by that Means the Equilibrium is preserved. The Pronator Teres may also have the same Effect upon the superior Part of the Radius, as the Quadratus has upon the inferior, viz. draws it inwards. When that happens, the Fracture is difficult to be replaced. In order to raise the Pieces, they must be forced to make the Swipe, by carrying the Wrist perpendicularly from upwards downwards, and pressing upon the Extremity of the Radius. If the Reduction cannot be effected by this Means, and the Patient be strong, an unequal Ligature is applied to the Wrist to make the Swipe of the Bone, and bring it back, whilst we cause the upper Part to be supported as usual. While this is about, the Surgeon examines if the Pieces are brought properly together, and he makes them even with the Palms of his Hands.

The first Thing applied upon the Fracture is a Compress slit at one or both Ends, with only the Middle intire. It must surround the fore-Arm. It should not be tight, for Fear of depressing the Pieces. Then we take two longitudinal Compresses as long as the fore-Arm, and two good Fingers broad. We place the one at the internal, and the other at the external Part of the fore Arm. If we would make Use of Paste Boards, they will be a Point of Support to sustain the Compresses, prevent a Displacement of the Bones, and secure the Muscles. There must be two, of the same Length, and Breadth, as the Compresses, and rounded at their Extremities. We are to put them in one of the Folds of the Compresses. A Space of about a large Finger's Breadth must be left between the applied Compresses, and they are to hang over with Borders,

ders, that the Turns of the first Band, which must begin either at the superior, or inferior Part may not depress the Pieces.

If the Fracture is nearer the superior, than the inferior Part of the fore Arm, the first Turns of the Band must begin precisely above the Wrist, and afterwards be carried upwards by obtuse Circulars to the Bend of the Elbow. We continue it along the Arm, without incommoding the Joint, to keep under the Biceps, which besides it's Use in bending, the fore Arm, likewise assists Supination.

The second Band is to make two Turns in the same Place as the First. After which it is passed betwixt the Thumb and fore Finger, in order to keep a square Compress, or a Cushion, in the Palm of the Hand, to support the Fingers, which must be half bent. From thence it is carried along the fore Arm by Circulars, and fastened where it ends.

After the two Bands, it is proper to apply two Oval Paste-Boards, notched at their Extremities. They must only be as broad as is necessary to prevent their Junction, and of nearly the same Length as the fore Arm. The one is to be placed internally, and the other externally. They are secured by two Pieces of Tape, or a third Band. The fore Arm, and Hand must be surrounded with a large Compress fastened with Pins.

The Patient is to keep the Bed, the fore Arm and Hand laid upon a Pillow, raised higher than the Arm, to favour the Course of the Blood. The Pillow should be preferred to the Sling for the first Days. By this Means, the Swelling, and Tension of the fore Arm, and Hand, will be prevented. If the Patient soon after grows weary of Bed, or the Situation he is obliged to remain in incommodes him, he may get up. A skilful Assistant supports the injured Part; the Patient sits down in an Arm Chair, having a Table near him of a proper Height to lay his Arm upon. As to the Sling, he may make Use of it when the Callus has begun to cement the Pieces, particularly if he is obliged to go out. In this Case two essential Circumstances are to be considered; the first, that the Arm being laid in the Sling, the Bend of the Elbow may not form too acute an Angle; it is more proper for it to be moderately bent. This Situation is advantageous, both to facilitate the Course of the Blood, and to give Elasticity to the Muscles. The second Circumstance is, that the Patient be careful not to keep his Fingers too much bent during his Disease, which Surgeons too commonly neglect to forewarn the Patient of. He should move them frequently, to prevent the Stiffness, and Tension,
that

that Want of Motion brings on. Is it not known that all the Tendons passing to the Fingers have each a Sheath, and that their Inaction occasions the Lymph, and Synovia, to be collected, even in the whole Extent of the upper Part of the Hand; by which Means, when the Patient is cured of the Fracture; he remains several Months unable to make Use of his Fingers? He must have Recourse to Embrocations, and other emollient Remedies.

The longitudinal Compresses, and Paste-Board Splints are applied next the circular Compresses instead of the first Band; as is always practised. The Compresses push on every Side against the middle of the fore Arm, and tend to keep the divided Parts of the Fracture in Situation, and the Body of the Muscles subject; which is done so much the more easily as the Turns of the Band applied above cannot press upon the lateral Parts of the Bones, whereas the Band applied immediately upon the circular Compress, and Fracture, depresses the Pieces. Therefore the Bandage must be begun as before mentioned, that it's Turns may not press upon the Fracture, wherein it differs from other Bandages, where the first Turns are applied upon it. These are the two Circumstances that distinguish this Fracture from all others.

These are the Means employed in treating successfully the simple Fractures, as well of both Bones of the fore Arm, as one in particular. I cannot dispense with remarking, that in this Species of Fractures, notwithstanding all possible Care during the Cure, an Accident frequently supervenes, which the Patient and Surgeon do not expect; viz. Pronation, and Supination can no more be performed: Nevertheless the fore Arm preserves it's natural Length, and Figure, scarce can the broken Place be felt. This Loss of Motion can only be attributed to the Extravasation of the ossific Juice, which cements both Bones together. The Motion of Flexion and Extension is free; but, when the fore Arm and Hand are to be turned inwards, or outwards, it is performed in the Articulation of the Arm with the Scapula, or the Head of the Humerus rolls in it's Cavity as upon a Pivot.

The Olecranon, as before-mentioned, limits the Extension of the fore Arm. The Eminence it forms externally is only covered by the Periosteum, an Aponeurosis, and the Teguments. Falls, or Blows, upon this Part, occasion very smart Pains.

The Fracture of this Bone may be simple, or compound. The simple is generally transverse. The Portion separated from the superior Part of the Ulna, is removed from it by the
Con-

Contraction of the Extensors; if the Fracture is accompanied with no Accident, it is easy to be assured of the Situation of the separated Pieces. The Arm remains pendulous, and immoveable.

To reduce this Bone, the fore Arm, and Arm are to be placed horizontally, and supported by an Assistant. The Surgeon, with his Thumbs placed alternately above the Piece, causes it to descend in order to be replaced, as is practised in the transverse Fracture of the Rotula; the Arm is slightly bent. Above the Fracture is placed a Compress one Finger thick, and two broad, over that a circular Compress, the whole secured by a Band, three or four Ells long, rolled in one Head. Three Circulars are made to keep the Pieces in Place; from whence the Band is passed into the Bend of the Elbow, where one Turn is made, then it is carried above the Joint, and Circumvolutions are made above and below as in Bleeding.

The Olecranon must not be compressed, for fear of depressing it, and to prevent an Ankylosis. The Arm must be laid upon a Pillow, as we have said in speaking of other Fractures. It is prudent in the Surgeon to prevent the Ankylosis by repeatedly moving the Part gently some Days after. This Process is likewise of Service in preventing an Inspissation of the Synovia.

The compound Fracture of the Olecranon is succeeded by that of the Radius, and inferior Part of the Arm. It is of two Kinds, with, or without a Wound. That without any Appearance of Division is always accompanied with Tension, an enormous Swelling, and Ecchymosis occasioned by the Displacement of the Pieces. This terrible Disease has always been looked upon as a compleat Luxation, and a great many Patients have perished by having suffered violent, and useless Extensions, and Counter Extensions. Of which I am going to give an Example.

OBSERVATION I.

A Joiner fell from a very high Place upon an Iron Balluster. He received such a Fracture, as I suppose, in the Joint of the right Arm. It was thought, that Extensions would relieve him. Instead of which, the Ecchymosis spread to the superior Part of the Arm. I was called in the Day after, and I took the necessary Precautions to appease the Symptoms, and prevent those which threatened the Patient's Death. I had Recourse to frequent Bleedings, and proper Topics; but I had the Situation of the Part particularly in View, which was essential.

sential. He was cured at the End of three Months, and retained Part of the Motions.

A Fracture complicated with a Wound, and where some Portions of the Bone stript of the Periosteum start out, has no other Remedy than Amputation. As to those with only a Wound, where the Bones do not start out, the Reduction must be attempted, and the eighteen tailed Bandage applied, as in the Species I have related the Example of.

OBSERVATION II.

A Man has been seen, who fractured the fore Arm four Fingers breadth from the Wrist. He was so imprudent as not to apply for Assistance. By his frequently moving the fractured Part, the broken Bones by their Frictions cemented separately. In consequence of which he had Flexion and Extension. After his Death the superior Part of the Ulna and Radius were found united together, and a Species of Cavity was formed there to receive the Ends of the opposite Parts, which were equally smooth.

ARTICLE III.

Of the Fracture of the Fingers.

THOSE, who understand the Structure of the Hand, know that it is composed of three Parts. The first is called the Wrist, and in the Skeleton Carpus, which is composed of eight spongy Bones, of different Sizes, and some of them of an irregular Figure. They are connected to one another by Ligaments. They may be fractured, or shivered by hard Bodies, as when a large Stone falls upon the Hand, which is stoppt by another hard Body, or else when a Wheel passes over it. All the Attention requisite, in such a Case, is to replace these little Bones by pressing with the Palm of the Hand, and prevent the Extravasation of the Synovia, which may occasion Ganglions; for it is impossible for the Tendons passing over the Wrist not to be more or less violently compressed.

The Palm of the Hand is the second Part. In the Skeleton it is called Metacarpus. It is composed of four long Bones placed at the Sides of one another. Their Bodies are cylindrical, and hollowed to contain the Marrow. They are equally exposed to be fractured, either by Blows, Falls, or Fire Arms. The Spaces betwixt them are occupied by the interosseous Muscles.

The Fractures of these Bones are easy to be reduced, and kept in Place, as they cannot separate from one another. Nevertheless, when the Fracture is caused by a very bruising Blow, the Tendons serving to move the Fingers, and passing along these Bones may be contused, from whence ensues a Swelling, or Distention of the whole Hand occasioned by the Stagnation of the Synovia contained in the Vaginæ, which Symptom must be remedied for Fear of an Abscess, or Loss of Action in the Tendons.

The Fingers are the third Part of the Hand, they are divided into Phalanxes. Each Finger has three. The first are larger than the second, and these than the third. The Phalanxes are exposed to Fractures, and to the same Accidents as the Metacarpal Bones.

As the Fingers are separated from one another, their Fracture is easily known. The Course of the Tendons must be attended to. The Reduction is easily effected by a slight Extension, which the Surgeon himself makes. The Pieces are to be kept in Place by a small circular Compress wet in a Defensive. A small long Compress, and Paste-Board Splint are applied both upon the internal and external Part, the whole supported by a small Band. The Patient's Fingers are to be somewhat bent, and his Hand hung in a Sling, to allow Time for the Callus to form.

OBSERVATION.

A Woman was struck with a Stick upon the upper Part of the first Phalanx of the Middle Finger. It remained totally benumbed, and extended, without Sensation, and could no Ways be bent like the other Fingers. She was dressed unsuccessfully for some Days with spirituous and resolvent Topics. The Finger was neither swelled, nor inflamed. Lastly the Skin shrivelled, and gradually changed Colour, so that the Finger remained intirely black, and dry. A Month after a slight Inflammation in a circular Form appeared upon the whole Circumference of this Phalanx, the sound Skin separated from the dead. This Place was brought to suppurate, where small Inequalities were observed. In moving the Finger it bent, and fractured intirely. It was necessary to cut the Tendons of the sublimis, and profundus, which held it. The Exfoliation of the Unevennesses remaining at the superior Part of the Phalanx was procured, and the Patient was cured without much Pain. The Blow was given perpendicularly. This Phalanx is articulated by a small Enarthrosis; there had been no Resistance on that Side; the whole Force of the Blow was spent

spent upon the Body of this Bone, which being hollow, and the Stroke having only fallen upon one Point, it was fractured lengthwise, as shall be afterwards explained. There is no Room to doubt but the Disorder reached the Marrow; which disunited the bony Fibres, and caused their Separation.

As for the Change, and Dryness seizing upon the Skin without a Separation of the Epidermis, which is a certain Sign of a Mortification, they can only be attributed to the violent Compression upon the soft Parts. This is what is called a dry Gangrene, which is communicated at the Instant of the Blow to the whole Circumference of the Finger. The Circulation and Course of the Spirits being equally intercepted, occasioned the Wound to be accompanied with no Symptoms, &c.

A Difference ought to be made between the Fracture of the Phalanxes of the Thumb, and that of the other Fingers, as they are larger; as it's Articulation and Situation are different; as it is destined to particular Motions; and as it's Motions excel them. It is also necessary to attend to the Muscles that are peculiar to it, and that have no Connection with the others. Consequently in the Reduction it is proper to observe not to remove it too far from the neighbouring Bones. The Apparatus no Ways differs from that used for the other Fingers. It must be more bent than extended. The Bandage is a Spica; the Bandage is to be an Inch broad. When we have made two or three Circulars upon the Fracture, we carry the Band over the Wrist, and pass it into the Hand, from thence round the Finger, and finish about the Wrist.

CHAP. VIII.

Of the Fracture of the inferior Extremities.

ARTICLE I.

Of the simple Fracture of the Thigh.

WE have under the general Head of Fractures spoken of their Differences, Species, Signs, Causes, and Symptoms. It was there observed that the Fractures of the Femur, are the Worst, and most difficult to be secured of all those of

the large Bones, that, in order to remedy them, it is necessary to be perfectly acquainted with the Structure of the Part.

The Femur is undoubtedly the longest, and largest, of all the Bones of the Body. It is hollow internally in Form of a Canal, to contain the Marrow. It is divided into Body and Extremities. The Body is longer or shorter, larger or smaller, according to Age, Sex, and Constitution. It's anterior Part is convex; the posterior slightly concave. A scabrous Line occupies near two thirds of it. The Remainder of the Bone terminates in a flat Surface.

The superior Part of the Femur has two unequal Eminences. The largest, and highest is external; the second is smaller, and internal; they are called the large, and little Trochanters. The Body of the Bone, that supports them, takes in elongating an oblique Direction. It tends from below upwards, and from behind forwards. This Continuation is called the Neck of the Femur. Upon it is set a large spherical Head, which is united in young Subjects by an intermediate Cartilage, and by Indentations; but the whole is cemented in the Adult, and then makes but one Continuation. The Head of the Femur is received in the Acetabulum. This Articulation moves in all Directions.

The inferior Extremity of the Femur has two large Eminences called Condyles. The internal is larger, and more extensive than the external. They are separated from each other posteriorly by a Space that is occupied by Ligaments, Fat, and the Passage of the Vessels. Anteriorly each Condyle has a smooth polish'd Surface. These Surfaces are separated by a Depression. That of the external Condyle is larger than that of the internal: the Rotula in it's Motions covers them. The Condyles are articulated, or received, into two superficial Cavities, at the superior Part of the Tibia. This Articulation is confined to Flexion and Extension.

The Species of Fractures to which the Femur is exposed, are not always easily found out; the great Number of Muscles that cover it, and frequently the Fat, prevent that Discovery. The Femur in the natural State never describes a straight Line; it is curved towards the Middle; its upper Part has a greater or smaller Circumference. It gradually becomes less towards the Knee.

What has been said of the Structure of the Femur appears sufficient to enable us to discover the Species of Fractures, and remedy them. We will here propose for Example, the simple and trans-

transverse Fracture. We will suppose it about five or six Finger's Breadth above the Condyles.

Before any Thing be undertaken, the Displacement that may happen to the Fracture must be attended to, which is very necessary to the Reduction. We are therefore to examine if the Displacement is breadthwise, or lengthwise; or lastly, if both Bones have remained in Situation. If a Portion of the Bone is displaced lengthwise, the Thigh becomes shorter; if breadthwise, one Portion is forced internally, externally, anteriorly, or posteriorly; then a Portion of the Bone remains in Place, and the other separates from it's Center. In such a Case the Thigh does not appear so short, but it is more swelled, and in greater Tension. If the Pieces preserve their natural Situation, the different Motions that are made to the Thigh, contrary to one another, manifest the broken Place by a Cre-pitation, more or less sensible to the Ear or Touch, which is the most certain Sign of it. Then the great Point in View is to secure the Fracture by the Bandage.

In order to which the Patient must be laid in a very even, and somewhat soft Bed. If the right Thigh is fractured, he must be placed on that Side; if the left, he is to be laid on the left. If the Fracture is lengthwise, it is necessary to find out how much the inferior Piece has gained upon the superior, or whether it is carried inwards, outwards, or laterally, which is of great Importance to know, in order to regulate during the Extension the Degrees of Force, that must be used to bring back the removed Piece to the Level of the other, and to calm the Symptoms depending upon the Periosteum, which is the Organ of Sensation, and has the greater Share in the Formation of the Callus.

The Patient must be held firm by an Assistant. A Second conveniently placed is to embrace the superior Part of the Thigh. He must be sure and steady. A Third is to be situated at the Foot of the Bed, who must support the inferior Part of the Thigh above the Condyles. Then the Surgeon is to charge the two first to keep in their Place. During this, he is to order the third Assistant to make the Extension, and with his Hands assure himself, by the different Motions that are made, whether the Bone can be reduced. He knows the Extension is sufficient by the approaching of the Piece, and by comparing the diseased Part with the sound, then he makes the Conformation.

If the Fracture is considerable, it frequently happens that no Success attends this Manner of operating, a too violent Contraction of the Muscles hindering it. To prevent the

Symptoms that might attack the Patient, if the Treatment was deferred, recourse must be had to Ligatures, as we have said, in speaking of the oblique Fracture of the Thigh, which we rank amongst the Compound.

When the Ligatures are applied, the Extension and counter Extension are made moderately, and increased gradually until the Piece of Bone can be replaced. The Surgeon, with a careful Attention to what he observes, makes the Conformation with the Palm of his Hands.

The Pieces thus reduced, he applies the Apparatus, which first consists of a Compress slit at both Ends. It is to be wet in such a Defensive as he judges proper. He makes use of it to surround the fractured Place, and with a Band about three or four Ells long, and three Fingers broad, makes three Circulars upon the Fracture. The Band is continued by Obliques to the Groin, where it is fastened. Then he takes a second Band, of nearly the same Length and Breadth, and makes three Circulars upon the first Band at the broken Place; after that he carries it down by the Obliques to the Knee, where he is to finish it. The middle and inferior Part of the Thigh must be provided with a longitudinal Compress to fill up its Curvature; and in order to render the Bandage even, he applies a graduated Compress, thicker on one Side than the other. The thickest must be at the lowest Part of the Thigh. Upon this circular Compress he places the long ones. They are three in Number; consequently they must be at equal Distances one from another. It will not be improper to furnish each with a Paste-board, or a thin Plate of light Wood of the same Length and Breadth. They are put in the first Folds of the Compresses, and secured by a third Band, whose first Turns may be begun at the Middle, superior, or inferior Part. Upon this Band are placed the Paste-Boards, one externally, and the other internally. They must not join. They should be notched at their Extremities, and fastened by two Strings. If the Band for the longitudinal Compresses is longer than necessary, it may serve instead of the Strings. If we fear a Displacing of the Pieces, in order to retain the Thigh in Situation, we make Use of the same Ligatures as were employed to make the Extension, the one is applied at the inferior Part of the Thigh above the Condyles upon a circular Compress, the other above the Malleoli in the same Manner. These Compresses prevent the Impression the Ligatures might make in the Teguments. They are fastened to the Foot of the Bed. The Patient's Body is supported by a Leather Strap lined with Cotton, or Linen, which is placed between the Thighs. The half of

of a Sheet, or a Tablecloth is also used. One End is put under the sound Buttock, and the other over the Groin; these Ends are fastened together, or separately, to the Head of the Bed. If fuller Instructions are wanted, recourse may be had to what has been said of the compound Fracture of the Thigh.

As for what remains, a long Band, provided with a Compress, ought to be preferred, to pass betwixt the Thighs, to prevent the Parts from heating. It is more commodious than the half of a Sheet, or Tablecloth, whose Bulk incommodes the Patient, and obliges him to different Motions very contrary to the Situation he ought to keep.

It is not strange in the Fractures of the Thigh that, though the Pieces of Bone be well reduced, and the whole Extremity secured by the Bandage, a Portion of the fractured Bone may happen to change Place, the Patient being laid upon his Back, and held firm by the Ligature. The Situation he is in, and the Extremity being placed in a straight Line, occasion the Head of the Femur to be quite close to the Rubis, at the Notch of the Acetabulum. We will give the Reason of this Displacing by simply describing the Structure of some Parts of the Femur. The internal Condyle is much larger than the external; it rests upon the Center of one of the Cavities of the Tibia, whilst the external is at some Lines distance from it; it is not therefore surprising, that by the least Motion of the Trunk, it falls upon the Head of the Femur, and pushes it from above downwards. If the Patient inclines upon the Side of the Fracture, that cannot happen, unless the Hip acts upon the Femur. The Fracture may be also succeeded by convulsive Motions, which produce the same Effect, owing to the involuntary Contraction of the Muscles. Let us now see how that happens. There is no Room to doubt, but the Femur is between two resisting Points. It's Head remains fixed in it's Cavity, the internal Condyle is immediately joined to the Tibia; thus a Compression is made upon both it's Extremities. Then the whole Force acts upon the broken Place; which cannot resist for Want of a Point of Support. Besides the Curvature of this Bone, and it's great Number of Muscles, do not contribute a little thereto. This Displacement is likewise occasioned by the Motions of the Patient, when he goes to Stool; which he cannot do, unless he moves the Trunk and Thigh in some Measure at the same Time. It is therefore true to say, that in all Fractures of the Thigh, Surgeons ought to make a doubtful Prognostic, and not assure the Patient, or

Assistants, that he will not in some Degree or other continue lame.

Many Practitioners have sought Means to prevent this Accident. They have had Recourse to Ligatures, flat Junks, the Manner of situating the Patient in his Bed, or placing him upon the cut or pierced Mattress, in order to ease himself, as has been treated of more at large in the Chapter of the oblique Fracture of the Thigh; but with these Precautions the Accidents are not always mastered.

Let us resume the Sequel of the Application of the Dressings. The Fracture must be placed upon the Middle of the Junks. They are to be flat, especially the external. The Manner of making them has been described before. The internal must only reach as high as the superior Part of the Thigh, for Fear of wounding the Scrotum in Men, and the Labia Pudendi in Women. The external is to extend to the true Ribs. Downwards both must pass beyond the Malleoli. They are made flat, to apply exactly upon the Bandage, and compress equally every where, by which Means they resist the great Displacing, which but too often happens to the Femur for want of using the necessary Precautions. The Linen of the Junks upon which the Fracture is placed must be stretched out, and without a Fold. The Assistant must by no Means quit the Extremity till it be placed by the Surgeon. It must be laid more inwards than outwards, to make it straighter. The whole Length of the Junks is to be rolled. As they join more closely to the Condyles and Malleoli, Care is taken to furnish those Places with square Compresses, sufficiently thick to prevent the Impression they might make, from whence would follow an Inflammation. Some Practitioners place Napkins folded at their Extremities on each Side, to fill up the Vacancy along the Leg, and use Compresses for the Condyles and Malleoli. The anterior Part of the Thigh, and Leg must be covered with a single Compress, or two placed together. These longitudinal Compresses serve for a Point of Support to the Strings, which fasten the Junks.

The four Strings are to be placed under the Junks, two for the Thigh, and two for the Leg. Two Napkins are passed under the Patient's Body, the one to surround the Thorax, and the other the Pelvis. This being done, we begin with tying the first String at the superior Part of the Thigh, and so on with the others. The Knots are to be made upon the external Junk. The Thigh and Leg being secured. The superior Napkin is raised, which is brought near the exterior Junk along the Side of the Breast; it must be provided with a strong Compress.

Compress. The inferior Napkin is to surround the Pelvis, and superior Part of the Thigh. This Compression forces the Femur inwards, and keeps it in it's proper Place. If the Patient is thin, a strong Compress is put between the Os Ilium, and Junk. It is also proper to place one at the superior Part of the Thigh, under the interior Junk, to prevent an intolerable Itching.

When the upper Part of the Femur happens to be broken in very fat People, great Care is requisite to keep it reduced; that is the Reason why we prefer to Napkins, two Belts of soft Leather fastened by Strings, or Buckles. It is also of Service to put one in the Room of the first String of the Junks; for, the tighter the external Junk is bound, the less does the Femur displace.

A Sole of Paste-Board, or very thin Wood, lined with a good Compress, is applied to the Sole of the Foot, and secured by three Strings. One passes through a Hole on each Side of the Sole. They are crossed in passing over each other, viz. that of the right Side is carried to the left, and that of the left to the right. They are fastened with Pins, or put under the Strings of the Junks, near the Knee. The third String, which is at the Extremity of the Sole, is fixed to the Middle of the two first. The Sole and Strings serve to keep the Foot straight.

The Heel is supported by a Piece of Sponge, a double-headed Roller, or a little Cushion, to diminish the Tension of the Tendo-Achillis. The Foot of the Bed is bounded by a Board placed transversely, for the Sake of placing a Log covered with a Compress, which serve as a Point of Support to the sound Foot. It relieves and keeps him from sliding. We must not forget to fasten a Cord to the Cieling of the Room. It is to pass through the Testern of the Bed, and fall down against the Patient's Breast. It's End must be provided with a Piece of Wood like a Packing Stick, and covered with Linen. The Patient makes Use of it to ease himself. Some content themselves with making Knots on the Cord, at some Distance from one another, which serve the same Use.

The Fracture of the Thigh of an Adult requires more Care than that of a young Subject, though the operative Part be the same, the Reason is, that in the Adult the Bones have acquired their perfect Solidity and Growth; that sometimes the Juices are vitiated, and too copious. If the Juices are too copious, the Thigh becomes deformed, which is frequently occasioned by the Displacement of the Pieces; this has determined many to the Expedient of breaking the Thigh anew, in order to remedy it. But this Operation has been unsuccessful;
nay,

may, on the contrary even, they have been in a worse State than otherwise they would have been in.

The Fracture in Children ten or twelve Years of Age, and more, cannot differ from that of the Adult as to the Cause, but it varies from it in Respect to the Formation of the Callus; because the Bones are in a continual Growth. The bony Layers, of which they are composed at that Age, when the Bone is entirely fractured, do not permit the Pieces to separate from each other as in the Adult, where they are generally even. For in that Age it is not to be wondered at, that the Bones never fracture clean, nor with Splinters. The Fracture most frequently is only known by moving the Part in different Directions, because the Figure of the Thigh is very little changed. The Crepitation is less sensible, and the Deformity not so apparent.

The Reduction is very easy; we have even no Need to recur to violent Extensions, and counter Extensions. Nevertheless, I do not pretend to lay this down as a general Rule. Cases may happen, where the Juices proper to form the Callus, extravasate for Want of being confined, and occasion a considerable Deformity. Gun-Shot, or, lastly, a high Fall, are Causes, that render the Fracture Compound. It is proper to remark, that the nutritive Juices are more copious in Youth, and the Cure quicker.

During the first Days after the Reduction of the Fracture of the Thigh, the Pieces may change Place, because the Bandage is not tight enough, this ought to be attributed to the Surgeon. The same Accident may also happen through the Patient's Fault, who, finding himself incommoded by the exterior Junk, loosens the Napkin surrounding the Body; the Hip being then free, the Weight of the Body makes it tend entirely towards the Fracture, and the whole Weight rests upon the Femur, which occasions the Fracture to be thrown outwards. If this happens to a Person of a certain Age, he can only be relieved by a second Reduction, which exposes him to very acute Pains. It may be remedied in a young Man, without making him suffer much, and without Symptoms, which is proved by the following Example.

OBSERVATION.

A Young Man, 14 or 15 Years of Age, fractured his right Thigh, four Fingers Breadth from the great Trochanter. It was reduced with all the Precautions proper for that Species of Fracture. The Patient was visited every Day, and nothing amiss was perceived. He was so indiscreet as to take out the
Pins

Pins from both Napkins, and first String of the Junk; which he owned to have done to ease himself a little. The Thigh appeared quite deformed; the broken Pieces were thrown intirely outwards in Form of a Bow. The whole Bandage was obliged to be removed. The Patient was held as in common, and by a slight and moderate Extension, the Thigh was replaced by the sole Application of the Palm of the Hand, which made the Pieces return from outwards inwards. He was perfectly well cured without limping. This Cure effected without Symptoms may be attributed to the Suppleness of the ossific Fibres, whose Texture is softer than in the Adult.

ARTICLE II.

Of the Fracture of the Neck of the Femur, which has been taken for a Separation of the Epiphysis.

THE Subject we treat on in this Article belongs properly to the preceding, but I have judged it interesting enough to make a separate one of it.

The last Species of Fracture of the Femur is then the Separation of it's Neck from it's Head. This Separation is a true Fracture, and not a Division of the Epiphysis, as some able People have pretended, who have considered it thus, as the Head is joined to the Neck of the Bone, as well by a Kind of Suture, as by the Interposition of a Cartilage, which is preserved to about twenty or twenty-two Years of Age; after which Time the Pieces are intirely cemented, and so closely joined that they make but one Body. This is the Reason that the Epiphysis in the Adult cannot be separated from the Neck but by a Fracture. It is true that in those Subjects in whom the Cartilage preserves it's Softness, this Separation may happen; but the Case is rare, nevertheless Experience has shown it. Indeed in many young Subjects where the Lues venerea, or Scurvy has made a considerable Progress, the Virus separates the Periosteum from the whole Circumference of the Neck of the Bone; it corrodes and eats away the Cartilage, and the Separation is effected without much Force, by the least Motion of the Patient. This Disease is very fatal, and irremediable.

The Signs of these Diseases are Pain, and an Inability of moving the Part. When a Bone is broken, the Part can no longer regularly perform it's Motions, as well because the Support of the inferior Piece of the Fracture is become unsteady, as by Reason of the Pain, which augments upon the least Motion

Motion by the continual Displacement of the Ends of the Fracture.

The following Observation will inform us of the Fracture of the Neck of the Femur, and show the different Opinions of several skilful Surgeons; some having considered it as a Fracture, and others as a Separation.

OBSERVATION I.

A Man aged fifty-five, being in his Chamber, which was slippery, and being unable to support himself, fell upon the right Side. That Leg instantly became shorter than the other about two or three Fingers Breadth, and the Buttock of that Side a little larger; the Foot turned outwards; this Extremity was deprived of it's Motions, and all those Changes were brought about without Pain. Twenty-four Hours after the Patient was seized with a Pain in the internal Part of the Thigh, and he chiefly complained of it, when he tried to bend the Thigh. Being laid down, the injured Thigh was easily reduced; but, as soon as the Extension was ceased, it got up again, and became as short as before. The Thigh and Leg gradually wasted, and the Patient visibly fell away.

Several Surgeons were called in, who differed in their Opinions about the Cause of all those Symptoms; but the most experienced agreed, that they were owing to a transverse Fracture of the Neck of the Femur. A Month passed, and no Bandage was applied. They contented themselves with embrocating the Part with Ol. Rosar. and Ol. Hyperic. after which they wrapt it in a Flannel dipt in warm Wine; but all these Helps were without Effect. It was afterwards believed that, if the Patient had been assisted by a proper Bandage for the Space of five or six Weeks, and kept in Bed perfectly still; after he had quitted the Bandage, this Limb would have been as long as the other.

A Month after the Fall the Surgeon who was last called in (Mr. Arnaud) having reduced the Thigh, applied a proper Bandage to it near the Trochanter. The Patient wore it for six Weeks, and kept in Bed perfectly still. By this Means the Leg and Thigh began to be nourished; and, after he had left off the Bandage, the injured Limb appeared as long as the other. He began to move it in all Directions, and without Pain; he stood upon his Legs; he stamped without Difficulty against the Ground with it; nevertheless he could not support himself, nor walk without a Crutch; and the Foot was always turned a little outwards.

When

Whenever he tried to perform a great Motion, he heard a slight Noise.

He easily moved the Thigh forwards, backwards, and also separated it from the other without Difficulty.

He could not bend it so easily.

When he forced the great Trochanter inwards with his Hand, he could raise, and extend the Part with more Freedom.

All those advantageous Changes occasioned a Belief, that the Neck of the Femur was re-united with the Head; but Experience proved the contrary.

First: Because the Patient could not support himself upon that Leg.

Secondly: By Reason of the Crepitation that was heard; particularly when the Motions of this Part were somewhat considerable.

Thirdly: Upon Account of the Facility he had of forcing the great Trochanter without Pain, and thereby rendering the Motions of the Thigh more easy. Let us now endeavour to explain the Changes that happen to the Thigh in the Fracture of the Neck.

First: The Leg is shorter than the other, because the Head of the Femur being no longer united to the Neck of the Bone; it is carried upwards, and backwards by the Contraction of the Glutæi Muscles which it obeys, and it is forced towards the same Place by the Weight of the Body when this Leg is rested upon; which is the Reason it becomes shorter than the other.

Secondly: The Buttock is larger, because the great Trochanter is carried upwards, and also thrown backwards.

Thirdly: Let this Leg be pulled ever so little, it appears as long as the other; because nothing prevents the Femur from being brought back opposite to it's Head. Sometimes we may be deceived therein, and instead of reducing it, we only draw the Hip downwards. The being subject to remount depends upon the Contraction of the Glutæi, and the Want of a solid Support.

Fourthly: The Foot is turned outwards by the Gemini, but that is when the Patient stands; for when he sits, it is not the Foot, but the Leg that turns obliquely outwards.

Fifthly: The Patient cannot support himself upon that Leg, because he no longer has a solid Support as before; since he does not rest upon the Ossa Innominata, and because the upper Part of the circular Ligament is his only Support, which is unsteady, extensible, passive, and may even lacerate.

Sixthly:

Sixthly : The Thigh is easily carried forwards and backwards, and it is more easily separated than bent ; because in the Fracture, the Support of the Femur is evidently brought nearer the Insertion of the Flexors of the Thigh, than that of the Extensors, and Abductors, whose Attachment is greatly removed from the Center of the Head of the Femur in the natural State ; and it appears that after the Fracture their Distance from the Support is not diminished in the same Proportion as that of the Flexors ; in short, the weak Support that is left them, which is the circular Ligament, is sufficient for these Motions, which ought to be considered as the Vibrations of a Part suspended, as it were, to a small Cord ; but when it must be intirely bent, this weak Support is not sufficient, whence would proceed very acute Pain.

Seventhly : When the great Trochanter is pushed with the Hand, the Motions of that Part become more easy, because then the superior Extremity of the Femur is restored to the Level of the fractured Head, which affords a Kind of Support.

Eighthly : When the Patient attempts to perform a great Motion, a little Noise is heard, owing to the Meeting of both Ends, the least of which, to wit, the Head of the Femur, is very moveable, and is pushed in many Directions, as much as it's peculiar Ligament can allow it : For it is necessary to observe that, though the Surface of the Head be always a little in Contact with that of the Extremity of the Femur, nevertheless it cannot follow externally the Motions of the Surface, which the Extremity of the Femur presents, on Account of the Ligament that attaches it within the Cavity, and confines it's Motions ; whereby these two Surfaces touch, and rub against each other, according as the Weight of the Body, and the Contraction of the Muscles move the Femur.

Ninthly, and lastly : After the Fracture, the Irregularity of the Motions is but slight ; first, because the circular Ligament confines the Motions of the Extremity of the Femur to too small a Distance from it's natural Place ; secondly, because the Portion of the fractured Bone is between the Acetabulum, and the Insertion of the Muscles, which nearly preserve their same Direction, and Order upon the Femur as in the natural State ; whereas, if this Separation was below their Insertions, the Irregularity of the Motions would be very obvious.

The Patient in the above-mentioned Observation, felt no Pain at the Time of the Fracture. The broken Extremity of the Femur, being always included within the Elongation
of

of the circular Ligament, which served it as a Sheath, it prevented the Inequalities at each Extremity from dragging the Muscles, and neighbouring Parts.

This Ligament, which is the sole Stay of the Femur, prevents the Pain and other Symptoms that would follow, and it is very probable that, without this Assistance, the Extremity of the Bone would have been drawn extremely high by the Contraction of the Glutæi, and forced towards the same Place by the Weight of the Body, when it rests upon that Leg.

Let us now examine the Progression of such Patients. The natural Situation of Man, when standing, is to be equally supported upon both Legs. Thus they equally sustain the Weight of the Body; therefore they ought to be of an equal Length; such Patients notwithstanding have one Leg shorter than the other. In order to render them equal, they bend the sound a little.

The Patient walks like those who have a wooden Leg. To explain myself clearly, it is first necessary to consider that the wooden Leg cannot be stretched out to throw the Weight of the Body upon the other Leg, and this bending, permits the whole Weight of the Body to fall upon it. This Leg being thus loaded, and rectified by the Extensors of the Leg, and Foot, raises that Foot as high as the wooden Leg had carried it, if it had been stretched out, and the other not bent, which lays the Weight perpendicularly upon the sound Leg, and sets the wooden one at Liberty to advance where we would walk, at the same Time that the Center of Gravity of the Body likewise advances to the same Side.

In this Manner the first Step is made. At the second the good Leg bends, after which it stretches out, and throws the Center of Gravity upon the wooden Leg, which gives it the Liberty of being carried in it's Turn towards the Place we would walk to.

It is now evident why those with a wooden Leg always limp on the contrary Side; because when they support themselves upon the other, which bends; the Center of Gravity with the whole Body descends, and then ascends, and thus as often as the Person supports himself upon the good Leg, the Body sinks down, and after that ascends on the same Side; this is really the Manner in which they limp.

Let us now examine how the Fracture of the Neck of the Femur may be distinguished from what is called a Separation of the Epiphysis.

When the Neck of the Femur is separated without Pain at the Instant of the Fall, and the great Trochanter ascends
and

and descends without Difficulty, it may be concluded that this Separation is a true Fracture, whose divided Parts are not armed with Points, which does not produce Pains, as in the other Fractures, &c.

As to the Separation, the Impossibility of it in Adults has been proved, and there is Room to believe that the Luxation of the Femur outwards, where the Head rests upon the Tuberosity of the Ischium, is what has been mistaken for a Separation of the Epiphysis. In this Luxation, the Buttock is extremely large, the great Trochanter being raised much higher, and more forwards, and the Foot turned inwards.

Amongst the Surgeons called in, three insisted, that there was neither Luxation, Fracture, nor Separation; and that the shortening of the Thigh proceeded only from the Injury done to the Muscles, whereby their Constructions were much stronger, which kept this Part shorter.

But to overthrow this Opinion, this Leg need only be laid in a parallel Line, and similar Position as the other, with Care that both Hips be even, and that the Leg be extended without any Violence; then if the Bone is in it's Place, and intire, this Leg will never be found shorter than the other. It ought not therefore to be charged to the Account of the Muscles.

It may be asked, if such Disorders are curable? The great Point consists in the Difficulty of fixing, and properly securing the Body of the Femur with it's Head; for in all Fractures, both Pieces must be so well adjusted and conformed, that they answer each other exactly, and that they be kept in this State firm and immovable.

In the Fracture of the Neck of the Femur, all the Methods that may be invented can only serve to secure one of the Pieces, which is the Body of the Bone; but, for it's Head, which is free in it's Cavity, it is very difficult to adjust, and confine it with the Femur, with which it was in Continuation before; for, though it be replaced in it's natural Length, that does not prove it to be in a proper Apposition with it's Head, which has no certain Support, and may have been displaced at the Time of the Fracture; and though these two Pieces should happen to be properly adjusted, the Difficulty of securing the Head would always continue the same; because the least Motion of the Trunk shakes, and displaces it; lastly, as the osseous vessels of both fractured Parts are exactly closed, the nutritive Juices cannot ouze out to form the Callus, by Reason of the Disorder of the Vessels.

Besides the external Causes which produce the Fracture now treated of, it is sometimes owing to a venereal, scorbutic, or cancerous

cancerous Virus, as in the Fractures of the other Parts of the Bones. I am going to relate one of the most terrible Examples of it.

OBSERVATION II.

A Woman of about fifty Years of Age was greatly tormented with a venereal Virus, for Want of having undergone a proper Course of Remedies. Her whole Body was covered with ulcerated Pustules. She had long had a Fistula, whose Edges were entirely callous, and from whence ouzed a Liquor of an intolerable Stench; she lost the Motion of the inferior Extremities; and complained of very acute Pains, tho' she was touched ever so slightly. She continued two Months in this State, and then died. I resolved to open her; and was greatly surprized to find the *Ossa Ilii* carious, and eroded in several Places, and the *Ossa Femoralia* slightly exostosed; each Neck was fractured without Displacement, and to that the Loss of Motion in the Extremities ought to be attributed, and which could not be remedied, &c.

Let us at present examine what are the Means the Surgeon ought to employ to secure the Fracture of the Neck of the Femur, and also a proper Apparatus.

The Patient must be laid on his Back in a Bed without Feathers. What we have said of the compound Fracture of the Thigh is to be attended to. The Surgeon is to order an Assistant to make a gentle Extension, whilst the Patient's Body is held fast by another. He must observe if the Hips are even, if the diseased Extremity is equal to the sound, and the Foot straight, and not thrown too much either inwards or outwards. This being well attended to, the Surgeon applies his Hands so as to bring the separated Pieces into Apposition; after which he applies the Apparatus, which consists, first of a large Compress a Foot and a half long, three or four Fingers broad, and an Inch thick. It is to be wet in a Defensive; the Middle must be placed upon the Groin, and the upper Extremity upon the Articulation of the Thigh; the inferior is to pass under the diseased Buttock, to cross upon the other.

Secondly, it is necessary to be provided with two large Compresses, sufficiently broad and thick, and two large Paste-Boards, that are to be cut, and notched according to the Manner wherein they are to be placed, that they may not incommodate the Patient, and yet apply exactly upon the injured Part. The internal Paste-Board should not be so large as the external one. Its upper Extremity must be notched, that it may not hurt the Scrotum, or Labia Pudendi. It is to surround all

the internal Part of the Thigh. The Center must be provided with a graduated Compress, likewise notched, and over it a second Compress, that is to cover the PASTE-BOARD entirely. They may be secured by some Stitches. At the superior Part of the PASTE-BOARD must be fastened a Band, a Piece of Tape; or lastly, a Leather Strap, of a Length proportioned to the Thickness of the Patient's Thigh and Body. One of the Ends is to be carried inwards, and the other outwards, that they may cross behind the Back upon the sound Hip, where they must be fastened.

Thirdly, the Compresses placed under the external PASTE-BOARD, must be larger, and of a proper Thickness, the PASTE-BOARD is to reach above the Middle Part of the Thigh. It's superior Extremity must be hollowed anteriorly, and posteriorly, that it may accommodate itself to the Convexity of the Buttock, and apply more easily. It should also be shaped to the Figure of the *Ossa Ilii*. It is to be provided with a Band, or Leather Strap, fastened to the opposite Side of the fractured Thigh, a little above where the interior PASTE-BOARD is secured. That the PASTE-BOARDS may exactly embrace the Thigh by their inferior Parts, they are to be cut in Digitations, or angular Portions. As the Bulk of the Thigh diminishes gradually towards the Knees, it is proper to surround it with a graduated Compress, it will serve as a Point of Support to the PASTE-BOARDS, which must be secured by Strings, &c.

The Apparatus that is proposed for the Fracture of the Neck of the Femur, ought likewise to serve for that of the great Trochanter. Perhaps it may not please every one, but I can certify, that it ought to be preferred, as well upon Account of it's easy Application, without fatiguing the Patient, as of it's Success.

It is true that, according to Authors, the Apparatus in these Sorts of Fractures is very simple, but it is not the same of the Bandage, which is applied by various Circumvolutions of the Band, such as that employed in the Luxation of the Thigh; for, the Globe of the Band cannot be passed and re-passed under the Patient's Loins, unless, he be raised up by the Assistants. In Fact, though the Patient should be able to raise himself up, by supporting himself upon the sound Leg, it is probable that, notwithstanding the Help of the Assistants, a Part of the Effort that might be made by himself, or by those who support the broken Part, would displace the Piece, to wit, that of the Femur, whose Continuity is separated from the Head, and that it might be forced inwards, or laterally, and yet the Patient not be sensible of it, nor the Surgeon,

Surgeon, after the Application of the Band, be able to discover it. The whole Disorder does not shew itself till after the Patient has long in vain expected his Cure.

This Disorder is of two Kinds; the first, which is the least terrible, is when the Pieces not being at a great Distance from one another, Nature furnishes Juices sufficient to cement them, and the Patient remains a Cripple.

The second is that, which we cannot remedy, or help, by any Invention, or Application. It frequently proceeds from the Surgeon's Fault, who has made Extensions, and Counter-Extensions, that are very useless, and hurtful to the Patient; because, the Pieces being thus removed from each other, the Juices cannot unite them together, therefore they extravasate and cement separately, from whence it follows, that after the Patient shall have remained five or six Months in Bed, the inferior Part of the Thigh will be without Support, unsteady, and movable in different Directions, and that the Foot will be no longer capable of supporting the Part. Then the Patient is under the unhappy Necessity of having Recourse to Crutches. This is too frequently the Case. It is proper likewise to remark, that this Accident may be owing to the Patient's Fault, by not exactly observing the Rules prescribed to him.

The Apparatus, and simple Bandage above described, must be supported by two flat Junks. The interior is to be so placed as not to hurt the Scrotum, or Labia Pudendi. The external Junk must reach to the Middle of the Thorax, and we secure it by two Napkins, the first of which we are to place towards the superior Part, and the second to embrace the *Ossa Ili*. In these Species of Fractures which happen near the superior Part of the Femur, it is very difficult, particularly in fat People, to be assured what Part is fractured; it is necessary, in order to master the Thigh still better, where the greatest Number of Muscles are, to apply a Band, or Leather-Strap there, that may keep the Junks firm, and prevent them from bending, and giving Way. This I have frequently practised with Success. By pursuing the above Method, there is the greatest Reason to hope, that the Patients will be able to walk, or at least, if any Accident should attend them, it will only be limping.

ARTICLE III.

Of the Fracture of the Rotula.

THE Articulation of the Thigh with the Leg is confined to two very sensible Motions, viz. Flexion, which is the

most considerable, and may on certain Occasions be forced beyond the natural State; Extension, on the contrary, is restrained to the Keeping of the Leg and Foot straight, without being able to pass beyond, let what Force soever be used.

The Condyles of the Femur project very much forwards, posteriorly they are less, and are, as it were, parallel to the two Cavities of the Tibia, wherein they are received, which facilitates the Flexion, but can be of no Use in Extension. The Condyles anteriorly are smooth, and polished by Means of a Cartilage. The external is larger than the internal. They have a Space betwixt them to receive the Rotula.

It is very spongy, and covered over with a thin bony Plate; it's external Surface is uneven, and it's internal smooth, and incrufted with a Cartilage which is divided into two Parts by an almost perpendicular Line. The Surface applied upon the projecting Part of the external Condyle, is larger than that answering to the internal.

The Rotula has the same Use as the sesamoid Bones, that are met within the Articulation of the Fingers and Toes, and it's Structure is the same. Their Use is to remove the Flexor Tendons of the Fingers from the Center of Motion. The Function of the Rotula is the same. The Difference is, that the little sesamoid Bones have very little Motion, and the Rotula a great deal. The Leg cannot be bent, unless it descends, nor extended, unless it ascends, and slides upon the anterior Surface of the Condyles. In certain Attitudes, it may likewise be drawn a little to one Side. The Attachments of the Rotula, in order to facilitate it's Motions, which are peculiar to it, are very strong, and capable of resisting the most powerful Efforts. It is generally this Resistance on every Side, which is the Cause of the Fracture, whereto it is very often exposed. To it's inferior Part, which is the least, and ends in an obtuse Point, is attached a very strong Ligament, whose other Extremity is inserted into the superior, anterior Part of the Tuberosity of the Tibia.

The superior Part of the Rotula is a little rounded. It is larger, and of greater Extent than the inferior. In this Part terminate many Tendons, and Aponeuroses. These are the Extremities of four strong Muscles, namely, the Rectus Cruris, the two Vasti, and the Crureus, which is betwixt both. The Tendon of the Rectus Cruris is precisely attached to the Center of the Rotula, and is parallel to the Ligament; the other Tendons are joined to it, and blended together, but are in Part attached laterally, and some Portions of them with others of the Fascia Lata terminate upon the Sides of the Tibia, chiefly

chiefly externally. Besides these Muscles, and it's particular Ligament, the Rotula has a close Connexion with the Capsula that embraces and surrounds the whole Articulation. Fatty Substances are met with in several Parts of it's Circumference, which may be considered partly as mucilaginous Glands, that serve to secrete the Synovia, that moistens, and lubricates the Cartilages.

The Rotula is so situated upon the anterior Part of the Condyles as to form a Prominence. It's external Part is covered with an Aponeurosis of the afore mentioned Muscles, and Teguments only, which renders it's Fracture more easy, and it is more subject thereto than the other Parts. It happens in several Ways; nevertheless in general it is not fractured, except when the Leg is forcibly bent. It's Ligament, and those of the Extensors, that are attached to it's upper Part, keep it fixt, and subject in such a Manner, that, in a Fall, the Rotula being engaged below by it's Ligament, and drawn upwards by the Extensors, those opposite Forces keeping it as in Equilibrio, it remains in a Kind of Rest, or else it's Ligament, or the Muscles that pull it must rupture, or itself must fracture. But, as the Ligament, and Muscles may stretch, and are less fragil than the Rotula, they remain intire, and it fractures.

If those to whom this Accident happens, kept their Legs extended and still, the Rotula would rise up very little, because there yet rests some Portions of Aponeuroses, which retain it; but as they will try to walk, and bend the Leg, they compleat the Rupture of the Remainder of this Aponeurosis by the Flexion, and the superior Part of the Rotula being fractured transversely mounts more or less along the Thigh, accordingly as the Extensor-Muscles contract more or less powerfully. Their whole Force is spent upon that Piece.

The Rotula is most commonly fractured transversely. It cannot happen but in a greater or lesser Flexion, succeeded by a Fall. Then the Center of the Rotula is found placed in the Space, or Vacuity, of the Articulation of the Femur, and Tibia. Both it's Extremities being in the State of Subjection before mentioned, it is not strange that the Fracture is transverse, the Center of the Rotula bearing hollow.

The longitudinal Fracture is very rare, nevertheless it ought not to be denied. It may be occasioned by Blows, or Falls, and may be looked upon like those of the Ribs produced by cutting, or piercing Instruments, that split them. These Species of Fractures are very difficult to be found out; but they

are easily cured, because the Pieces never separate. The Fracture may likewise bear a Relation to the Fissure, that happens to the Tibia; but this is always succeeded by terrible Accidents, upon Account of the Separation of the Periosteum, &c.

The Rotula may likewise be fractured obliquely, and in several Pieces; but this can only be owing to considerable Falls, violent Blows, or lastly to Gun-shot. The Symptoms in this Case are so quick, and the whole Joint so swelled, and in such great Tension, that it is almost impossible to judge of the Division of the Rotula. This is the Reason, that many Patients remain lame, and even are lost by ensuing Collections of Matter. The Amputation of the Thigh is the only Remedy to save the Patient's Life.

The Rotula being fixed, and supported upon the Condyles, a Blow from a bruising Instrument may separate a small Portion of it, though it cannot be discovered at the Instant. The Symptoms of this Fracture are not very bad. The Patient finds himself incommoded in Progression, and feels Prickings at Times. In such a Case it is necessary to make the Patient keep the Bed for some Days, in order to let the Tension, that may have happened, diminish. That being done, the Surgeon, upon the Patient's Report, searches in the whole Circumference of the Rotula with his Fingers, and assures himself of the Fracture by a little Vacancy, a slight Crepitation, and the Pain he feels. He then brings the separated Portions together, and secures them by a circular Bandage.

We know that there is a transverse Fracture, when a Depression is felt in the Center of the Knee. Nevertheless, as the Piece may be small, it will be very difficult to arrive at an absolute Certainty. If the superior Piece is removed to a great Distance, the Leg may be easily extended, but it cannot be bent except with great Difficulty. When the Fracture is in several Pieces, though the Knee be in considerable Tension, yet by a due Extension of the Leg, the Pieces may be distinguished. As for the longitudinal Fracture, it cannot be ascertained unless the Pieces be totally separated, and an Unevenness be felt by the Thumb, or one of the Pieces gives Way to the Pressure, or be separated from the other.

The Causes of the Fractures of the Rotula, like those of other Parts, are Blows, and Falls.

The Prognostic of the Fractures of the Rotula is not commonly bad; when the Surgeon duly attends to it; it must, however, be allowed to be true, that, if the Pieces are numerous, the Juices will extravasate, and occasion an Ankylosis. It

It is in these Circumstances that the Surgeon ought to redouble his Care, that he may assure himself of the State of the Disease, and inform the Patient, or his Friends of it.

If the Fracture is made by Gun-shot, the Swelling, which is always a Consequence of this Sort of Wounds, as also the Contusion of the soft Parts, may hinder the Discovery, and the Consequences are always to be dreaded; but when all these Symptoms are calmed, and the Fracture has been handled, and the Pieces brought together, in order to procure the Re-union, the main Thing to be attended to must be to manage the Bandage in order to prevent the Gangrene. It is also proper to embrace the Rotula with the Fingers, and move it gently, to prevent it from contracting Adhesions to some of the bony Parts upon which it rests.

The Symptoms not decreasing, and the whole Joint being distended, notwithstanding the Application of Topics, it is to be feared, that the Synovia may by it's Lodgment become corrosive, and that eating away the Cartilages, and Ligaments, it may occasion an Abscess, Sinuses, and even bring a Caries upon the Joint. In order to prevent such great Disorders, it is necessary to amputate the Thigh at the Beginning: This is the Practice of good Surgeons. If this Method, which is the only one, is not pursued, it costs the Patient his Life, after he has suffered violent and cruel Pains.

In the transverse Fracture of the Rotula, the Surgeon considering that the superior Piece can only be dragged upwards, either by the Contraction of the Extensor-Muscles of the Leg, or by the Motions of this Part, which the Patient may make, his whole Care is to render himself Master of that Point. To succeed therein, he orders an Assistant to hold the Leg firm and steady, and greatly extended, and with both Thumbs, which he uses alternately, he gradually brings the Piece down into it's Place. He ought to be particularly careful, that the Patient does not bend the Leg upon any Account whatever; because he would thereby separate the Piece of Bone more than it was. This is so true, that it scarcely gets up again in those, who immediately after the Fracture have kept their Leg extended; on the contrary it gets very high in those who have fallen with the Leg bent, or in those whose Leg has been bent for the Sake of finding out the Fracture.

This is a very essential Remark; for, though the Rotula be fractured, yet some Portions of Aponeuroses remain, that detain it, which are destroyed by bending the Leg.

The superior Piece of the Rotula being brought back quite close to the inferior, which is immovable, the Bandage, named

Kiafter, is applied, which is made with a Band about an Inch broad, seven or eight Ells long, and rolled into two Heads. Before it is applied, the Apparatus must be placed, which consists in the following Particulars.

First, a Compress four Fingers Breadth long, which is placed on the posterior Part of the Ham upon the Course of the Vessels. It is to be kept on by a Paste-Board, a little longer, and broader.

Secondly, a simple Compress a Foot long, slit at both Ends, and pierced with a round Hole in the Middle, a little larger than the Rotula, upon which it is placed. The two upper Ends rest upon the Thigh, and the other two upon the Leg.

Thirdly, during the Application of the Apparatus, the superior Piece is kept in Situation. It is secured by a Compress an Inch thick, two Fingers broad, and four long. A second is placed below the inferior Piece.

Fourthly, we take the double-headed Roller, and apply it's Middle upon the superior Compress, in order to pass a little obliquely under the Ham, where we cross the Heads of the Band to be carried upon the Sides, and cover the Compress below the Rotula. This Cross is fastened to the Compress with a Pin. We carry it obliquely upon the Sides of the Knee to pass under the Ham, where we make a second Cross in order to return to embrace the superior Compress, always directing the Heads obliquely, which we likewise fasten with Pins. After which we bring it down under the Ham to make a third Cross, and return upon the lower Compress, where we fasten the Heads with Pins. In this Manner we continue to make a fourth and last Cross upon the upper Compress, which we fasten like the others. From thence we again pass obliquely under the Ham, and cross the Heads in a direct Line with the Middle, we pass upon the Sides of the Knee, where we secure them.

Fifthly, we take a Napkin, or large Piece of Linen, rolled like false Junks. We line the Space betwixt the two Rolls with a very thick Compress, which we fasten to the false Junk by a Basting. This Compress must be so disposed as to form, length-wise, four or five large Folds, which leave a Space between them in Form of a Groove. We place it under the Middle of the Ham, and apply the false Junks, one on each Side upon the Condyles. The above mentioned Folds serve to fill up the Spaces at the posterior Part of the Ham. As the Rotula is bare, we cover it with a moderately thick Compress; after which we cross the Ends of the slit Compress, beginning with one of the superior, which we bring down obliquely upon the

the Rotula, and carry the opposite Head upward in the same Manner, then we cross the other two Heads: Thus they make a St. Andrew's Cross upon the Middle of the Rotula. We are to bring the false Junks exactly close to the Condyles, where they are to be secured by several circular Turns with the Remainder of the Band, making Use of one Head for the ascending Circumvolutions, and the other for the descending. Both must be in Form of obliques. By this Method the Ends of the slit Compress, and the false Junks are secured, and the whole Apparatus is covered.

When we would visit the Rotula, we undo the circular Turns, and the Crosses of the slit Compress. The false Junks being set at Liberty, we remove the Compress, that covers the Rotula without undoing the Rest of the Bandage, or displacing the Pieces, that are properly secured by the Kiasster.

This Bandage, which ought to be preferred to all others, though it be made differently, is proper for all the Species of Fractures of the Rotula, except the longitudinal.

Suppose the Rotula be totally fractured lengthwise, and the Pieces preserve their natural Situation, the circular Bandage is proposed, like to what is used for different Parts, as the Fissure of the Tibia. But there is a vast Difference betwixt the Fissure of the Tibia, and the longitudinal Fracture of the Rotula. This last Bone is broken in its whole Thickness, and one of the two Pieces may be easily separated, or brought near the other. It is not the same with the former; for, as it is almost impossible for it to extend the whole Length of the Bone, which may nevertheless happen, the spongy Texture of the Epiphysis would stop it by deadening the Violence of the Blow. Both Edges of the Fissure are so firm that they almost invincibly resist the Compression of the Bandage, which binds, and embraces them. This is so true that, if the Rotula was only simply crackt, the Bandage would be as useless to it as to the Tibia. In short, the Bandage is only contentive here. Its Utility is very easily seen in the longitudinal Fracture of the Rotula, because it presses immediately upon the Bone, whereas in the Leg it presses upon all the Muscles, which, being soft, give Way more easily than the Bones.

There are some Moderns, who besides the Bandage, put the Patient's Knee in a grooved Box. It is made of Tin, or Iron Plates. The Sides are intire; at the Bottom is a little Door, hung upon two little Hinges, and fastened by a small Hook. The Sides of the superior Part make a flat Surface about two Lines thick, pierced at Intervals with several little Holes by a Screw to receive the Vices. Upon each Extremity, when the

the Knee is placed in the Groove, is applied a Piece of the same Matter in Form of a Crescent, four Fingers broad, having two flat Ledges pierced equally, which answer to those above described. They are hollowed in the Parts where each answers to the Extremity of the Rotula, *i. e.* inwards, to be accommodated to the Bandage. The Screws are closed as much as is necessary; there are four at each Extremity, two at each Side. Lastly, according to the Size of the Part, they are brought near, or removed. The Bottom of the Groove within is provided with a Compress, which may be taken away in Case it be necessary to examine the posterior Part of the Ham by Favour of the Door. The Sides, and upper Part, are equally provided with Compresses more or less thick. This Box, or Machine, is of no other Use than to secure the Articulation; but, when the Bandage is accurately applied, the injured Part may be laid upon a Pillow, and the Sides being raised up, they are kept together by two Strings. This Method of treating the Fractures of the Rotula is more easy, less embarrassing, and the Patient is less incommoded.

Undoubtedly Fractures of the Rotula being neglected sometimes cause Accidents, especially the Loss of Motion of the Part, and Leg. The violent Impressions that are made on the soft Parts, the Ligaments, and Cartilages that incrust the Surfaces of the Rotula, and those of the anterior Part of the Femur, by Blows, or Falls, very often occasion a Disorder, as for Instance, encysted Tumors, in Form of a Wen, upon the external Part of the Rotula, which increase more or less. As for the Cartilages, they may be so compressed, that they insensibly become dry, crack, and pain the Joint, more or less; the Collision of the Pieces against one another in Walking makes an audible Noise. In other Cases it happens that the officic Juices both of the Rotula, and Circumference of the Femur, extravasate quite round, where they are confined by the different Motions, and by the Capsula, which in Time gradually deprive the Patient of the Power of Progression.

When the peculiar Ligament of the Rotula is ruptured, there is no Cure; the Patient must absolutely feel the bad Effects of it the Remainder of his Days. The Rupture may be produced two Ways; the first, when the superior Extremity of this Ligament is separated from the inferior Extremity of the Rotula; the second, when it's opposite Extremity is separated from the Tuberosity of the Tibia; or when it breaks in the Middle. It's Attachments appear able to resist the greatest Shocks, it's Sides are strengthened and supported, by the Appendices of the Extensors of the Leg; the Aponeurosis of the Fascia lata covers it; not-

notwithstanding all these Supports, the above-mentioned Accidents happen to it. A violent Flexion is the true Cause of it.

OBSERVATION.

AMongst others, I have seen a young Man aged twenty-five, who coming from a Court to enter into a Room, where there were two Steps of Descent; the Point of his Foot was caught by a Stone in the Pavement. This false Step made him fall upon the Pavement beyond the Steps, with his Knee bent, the whole Force was spent upon the Flexion; the Resistance of the Extensor-Muscles, the Situation of the fixt Rotula, and the Attitude of the Patient at the Time of the Fall, did not contribute a little to this Separation. Being raised, he could not support himself upon the Foot, nor move the Leg. The Tension, and Swelling of the whole Joint, came on so suddenly, that it was impossible to be certain of the Rupture of the Ligament, or even of the Situation of the Rotula. A Surgeon of the Patient's Acquaintance, treated him for some Time without Success. As the Swelling continued, the Patient could not move the Part. He saw several Surgeons. The Topics that were ordered him diminished the Size of the Joint. The Situation of the Rotula was known, and also the Rupture of the Ligament, by the Vacancy that was felt in the Center of the Articulation. The Rotula was lodged two good Fingers Breadth above the Condyles. It was immovable, and strongly attached to Portions of the Vastus externus, and internus. Every Expedient was made Use of to replace it, but to no Purpose. The Patient remained a Year without walking. He afterwards tried to do it. When he attempted to descend the Stairs, he did it without much Difficulty; but, he could not ascend except with great Trouble; he limped little; he could not kneel down, nor remain in that Situation. An Expedient was found out to relieve him, which was to put a little Pad upon the Part the Rotula occupied, which was fastened by Strings round the Knee. Hereby he was greatly eased, the Motions were effected more freely, he was less incommoded, and bent the Leg with Freedom, and supported himself upon it.

It has been seen by Experience, that besides the Rupture of the Ligament, the tendinous or aponeurotic Portions, attached to the Sides of the Rotula, or Tibia, are separated by Falls; which has allowed the Rotula to be carried upon the opposite Side; by Reason of the Contraction of the Muscles, that were intire. A similar Accident produces an Ankylosis of the Rotula at last. If it be not carefully attended to, it is imagined to be

be the Condyle that is thrown to the Side, and this Accident has been taken more than once for an incompleat Luxation of this Joint.

ARTICLE IV.

Of the Fractures of the Leg.

THE Leg is known by Anatomists to be composed of two Bones, one situated inwards, and the other outwards. The larger is called Tibia. It is easily known in all People by the Spine that extends quite along it's anterior Part, which is only covered by the Teguments, and Periosteum. It is larger at it's superior, than inferior Part. It is articulated above with the inferior Extremity of the Femur, and below with the Foot. At it's external Side is a slender Bone, whose Body has several Eminences, and Surfaces, more or less obvious. It is called Fibula. It no ways serves to the Articulation of the Thigh, as it is joined to the Tibia below it's Condyle. It is not so with it's inferior Part; it extends below the semilunar Cavity of the Tibia, where it is close bound by Ligaments. This Prolongation is named Malleolus Externus. It serves to limit the Motion of the Foot outwards, in like Manner as that at the inferior, and internal Extremity of the Tibia, called Malleolus Internus, confines the Motion inwards.

The whole internal Surface of the Tibia is convex. It's external Part is concave, chiefly towards it's Middle. Those of the Fibula vary. The Situation and Union of these two Bones is such that, the Space they leave betwixt them from one Extremity to the other, is occupied by a tendinous Aponeurosis, and a great Number of Muscles, which surround the Fibula on every Side; whence it cannot be distinguished by the Touch. An Infinity of Things particular to them are not remarkt here; it is sufficient to give the Structure thus simply, in order to enable to distinguish whether of them is fractured, for the Sake of remedying it, which is sometimes difficult enough.

As I have spoken in the Beginning of this Treatise of the Cure of the simple Fracture of the Leg, which I have given for an Example of these Species of Fractures, I have nothing left to do but to entertain my Readers with the compound Fracture of the same Part. I suppose it produced by an external Cause.

The compound Fracture of the Leg differs from that of the fore Arm, though these two Parts be equally composed of two Bones, as well in Respect to the Treatment, as to the Situation the Leg is to be placed in. This Fracture is with, and sometimes without a Wound. The first Kind permits us to be assured

sured of, and to determine it's State ; the second, on the contrary, imposes upon ; and frequently deceives the most knowing in the Art. I will not repeat here every Thing that has been said in general, and particular concerning the Fractures. I will confine myself only to some important Articles, which are the most useful, urgent, and necessary for the Knowledge and Treatment of the Disease.

First, Attention must be had to the Situation of the Fracture.

Secondly, To the Cause that has produced it.

Thirdly, It is necessary to examine whether the Bones are uncovered, and stript of their Periosteum.

Fourthly, Whether the Disorder of the Bone is considerable, and if there are Shivers.

Fifthly, Whether the Fracture is attended with a violent Contusion, and Loss of Substance of the soft Parts.

Sixthly, Whether there is one or several Vessels opened, especially whether they be Arteries.

In respect to the Situation of the Fracture, that which is at either Extremity of the Bone is more to be feared than that which happens in the Middle of it's Body ; for the Inflammation is not long in appearing, it is soon communicated to the Tendons, Aponeuroses, and Ligaments ; the Pain increases, the convulsive Motions are felt coming on gradually ; and the Wound changes it's Nature, which is easy to be proved.

OBSERVATION I.

A Strong vigorous Man, about thirty Years of Age, fell thirty Feet high. His Malleolus internus was fractured with Wound, and the Tibia forced out of it's Articulation. The Astragales remained bare. Amputation was thought necessary, but the Patient would never consent to the Operation. Trial therefore was made to force the Tibia back into it's Place by Means of Extension. The Patient was dressed, and bled several times without any Symptoms appearing. The third Day from his Fall the Wound became pale, and the Epidermis separated from all it's Circumference ; the Fever came on with some convulsive Motions, which were soon succeeded by the Gangrene. Could a Fracture of this Nature fail to destroy the Patient for having opposed the Amputation, which was the only Remedy to save him ?

In Respect to the Cause, Attention is to be paid to what has occasioned the Fracture ; since it is from thence we must draw the Prognostic of the good or bad Success that ought to be expected.

expected. A Fracture occasioned by Gun-shot most frequently requires Amputation. It is the same if it is owing to the Wheel of some Carriage, or if the Bones be shattered, and as it were ground to Powder.

The Fracture where the Bone is separated from it's Periosteum, is one of the most terrible; yet it is necessary to endeavour to replace the Pieces, and bring the Lips of the Wound together, to give Nature play to regenerate this Membrane. If the Wound swells, we are to make Incisions, to facilitate the Suppuration, to procure an Exfoliation, or cut it. In Case these Helps do not calm the Symptoms, there is no Time to lose, it is necessary to proceed to the Separation of the Limb.

In all Fractures where the Bones are extremely displaced, or at a great Distance with Splinters, and where the Shivers cannot be replaced, or extracted by the common Ways, there is no Time to hesitate, the Limb is to be extirpated.

There are no Fractures with a Loss of Substance, and Contusion where the Parts do not require a Suppuration, more or less copious, and hastened, to arrive at a quick Regeneration, and Cicatrix. During this it is necessary to be attentive to what passes in the Fracture.

Of all the Accidents in a Fracture, the Hemorrhage is the most to be dreaded, especially if it is owing to the Aperture of an Artery. If it cannot be stopt by Compression, Caustic, or lastly by the Ligature, which is to be preferred, the most quick Remedy, to save the Patient, is Amputation.

The compound Fracture without Wound is generally difficult to be found out, on account of the sudden Symptoms that accompany it. The Leg becomes so enormously swelled, that it prevents our being assured of the Existence of the Fracture. Besides, the Muscles are so compressed by their particular Sheaths, and by that which is common to all the Leg, that it, as also the Foot, becomes incapable of being moved.

This Tension is sometimes occasioned by Splinters entangled in the Bodies of the Muscles, which cannot be perceived by the Touch, and ascertained by any other Signs; unless they afterwards cause Abscesses, through which they escape.

Those Shivers may occasion an aneurismal Tumor, more or less considerable, and which is not discovered 'till some Time after. The Treatment of it is of the most delicate Kind, whether the Tumor be formed by venous Blood, or if it extravasates in the Skin, or even in the Muscles. In the first Case, Recourse is had to the Opening of the Tumor; and in the second, it's Transpiration is procured, and Part of it re-enters likewise into the Vessels. Then it is impossible to

make

make Attempts for Fear of increasing the Disease. I am going to relate an Observation that proves the greatest Part of the above advanced Truths.

OBSERVATION II.

A Man, aged sixty, being drunk, fell upon the right Side. In less than an Hour the Leg and Foot became so distended, and large, that it was impossible, notwithstanding the different Motions that were made to the Leg, and Foot, to be positively assured of the fractured Place, though it's Existence was believed. A Separation of the Joint of the Foot from the Leg was really found out by a forced Crepitation, and by the Situation of the Foot, which was turned quite outwards. There was no Room to doubt of a Laceration of all the Ligaments. They contented themselves with laying the Leg and Foot in a proper Situation, and with an Apparatus proper in such a Disease.

The Patient, when he became sober, was bled, which was repeated several times. Notwithstanding the Evacuations, and Defensives, the Foot, and a great Part of the Leg became ecchymosed. The Decoction of Flor. Sambuc. sharpened with camphorated Brandy was employed. The Tension, and Ecchymosis continued above three Weeks, and the Patient was troubled with very smart, and acute Pains, which deprived him of Sleep Day and Night. A Tumor appeared a little above the Malleolus externus, which was opened, and a great deal of clotted Blood, and a Splinter discharged from it. The Wound was treated as in common. The Ecchymosis disappeared insensibly, though the Tension remained in the same State. It increased from Time to Time to such a Degree, that the Foot was above four Fingers Breadth out of the natural State. The more they tried to master the Foot, and bring it inwards to be laid straight, the more the Patient suffered. Towards the third Month, after several Topics had been used, the Leg, and Foot relaxed gradually. A Tumor appeared above the Tarsus on the Side answering to the great Toe. It contained a great deal of viscous Matter, and a Portion of the Tendon of the Tibialis anticus, which answers to the first Os cuneiforme. The Exfoliation over all the Symptoms ceased; then it was not difficult to be certain of the whole Disorder. The Fracture of the Tibia was obvious by the Deformity of the Part, and the Astragalus and Malleolus were entirely displaced. As all the Ligaments had been destroyed, and the Tendon of the Tibialis anticus ruptured; it is not surprising that the Action of the anatognist Muscles had forced the

the Foot outwards, as it met with no Resistance. The offic Juices, with the Synovia, formed an Ankylosis, whereof the Patient has remained lame. It was proposed, upon seeing the Accidents, to amputate the Leg, this seemed the only Recourse to save the Patient; nevertheless they durst not undertake it, as he was accustomed to drink Brandy.

A Fracture with Splinters, without any apparent Solution of Continuity, frequently occasions Symptoms difficult to be foreseen. An Aneurism produced by the Point of a Splinter is the most melancholy. The violent Compression of a solid Body upon the Leg may likewise cause it. In such a Case the Aneurism is true or false. The true, which is a mere Dilation of the Artery, does not show itself 'till a long Time after the Fracture, by a Pulsation more or less sensible, which the Patient first perceives. As for the false Aneurism, it must be considered in two Ways. First, if the Trunk of the Artery is intirely opened. The Blood diffuses itself into a great Part of the whole Leg. Secondly, if the Artery is merely grazed on, the Blood escapes only by Drops. Then it forms a Tumor in Shape of a Cyst, which is not perceived 'till after the Reduction of the Fracture; and it is even frequently taken for an Abscess. These Tumors require great Care in their Treatment.

OBSERVATION III.

A Certain Person, endeavouring to stop the Horses of a Coach, was thrown upon the Ground, and the fore-Wheel passed over the Middle of his Leg, which fractured both Bones. As the Leg swelled, and even shortened, neither an Extravasation of Blood, nor a Tumor were found out; the inferior Portion of the Tibia was only perceived to have forced the Skin about an Inch outwards. After the Bones were reduced, and the common Bandage applied, the Fracture not being looked upon as compound, the Patient complained of a Numbness of the whole Leg succeeded by Startings, which made it necessary to undo the Bandage.

The Apparatus being removed, a Tumor as large as a small Nut filled with a Fluid appeared. Then Recourse was had to the eighteen tailed Bandage, and to warm Wine as a Resolvent. This Remedy being continued three or four Days unsuccessfully, the Tumor neither increasing, nor diminishing, it was agreed to give vent to the contained Fluid, which was done. The Blood issued out very briskly, but it was discovered by the Quantity discharged therefrom that the anterior tibial Artery was opened, which made it necessary

to dilate the Wound, in Hopes of applying the Ligature, which was impossible. In order to stop the Blood, the Wound was filled with Lint, dipt in Brandy, which succeeded. The Patient was dressed twice a Day. The Suppuration came on towards the fifth. Care was taken not to remove all the Lint, that the Artery might consolidate; but the offic Juices destined to form the Callus not being confined, were lodged upon the Sinderon of Lint that closed the Mouth of the Vessel, which inflamed the whole Wound considerably. This Accident was attributed to the Stay of the Lint, and the Suppuration was intercepted. For Fear of a Gangrene it was resolved to remove the Lint, charged with a Matter, which, undoubtedly, had fermented by its Lodgment. The Symptoms ceased, the Suppuration was re-established, and the Pledges were found at every Dressing charged with the Matter of the Callus, which ceased in a few Days. There is Room to believe that the Artery was compressed as well by the Fibula, as by the offic Juices diffused in the whole Circumference of the Fracture to form the Callus, because the Blood was stopped. The Patient was cured, except of a slight Deformity remaining upon the Fracture.

In the compound Fractures just mentioned, it is necessary to manage the Motions of Extension, Counter-Extension, and Conformation; this is particularly essential when the Fracture is with Splinters, or a Loss of Substance.

It happens indeed that in a forced Extension the Pieces of the fractured Bone may be removed from one another: Now, the Consequence of this Distance is, the nutritive Juices are not sufficient to furnish a Quantity proper to form the Callus, and the Ends of the Bones cement separately; which has been observed in many People, especially in old Men, and in People of a decayed Constitution, who have passed the rest of their Days in Bed unable to rise.

A forced Extension owing to the Surgeon's Want of Attention may likewise occasion a Laceration of the Muscles, and too great a Tension both of the Vessels, and Nerves, from whence ensue terrible Symptoms; for the Inflammation begins with Tension of the Part, the Fever comes on, the convulsive Motions are felt, sometimes the Part becomes paralytic: Now all these Symptoms tend to the Gangrene, Sphacelus, and lastly, to the Loss of the fractured Part, and even that of the Patient's Life, if they are not prevented by an experienced Practitioner; this shows what Caution is to be used in the different Motions which the Assistants execute by the Surgeon's Orders.

If we ought to attend to what passes in the hard, and soft Parts, it is not less important to have an Eye to the Situation, which the fractured Part should keep, and likewise to the Application of the Particulars proper to the Apparatus and Bandage.

The eighteen-tailed Bandage ought to be preferred in such a Case, and prepared with every Thing depending upon the Apparatus, before the Pieces be reduced into their natural Situation, unless an Hemorrhage should oblige us to follow another Method.

Therefore the Leg must be held, as explained elsewhere, by two Assistants. Upon the Patient's Bed, at the fractured Place, are placed four Pieces of Tape at some Distance from one another. The first is to be laid above the Knee, and the others disposed along the whole Leg, so that the last be above the Malleoli. Upon these Strings the Junks are placed, which are separated one to the Right and the other to the Left: In the Middle is put the eighteen-tailed Bandage, which is to be made, and cut, as described elsewhere; so that there be nine Heads on each Side of the Leg. All the intire Part of the Bandage, viz. the Middle must be covered with a longitudinal Compress, sufficiently thick to receive the Pus, or other Matter, in Case of a Wound, to avoid the Change of the Bandage at every Dressing; which would be inconvenient, and even hurtful, through the Risk of displacing the Pieces of Bones. Upon the Middle of the longitudinal Compress is placed a simple Compress transversely. Both Ends may be slit. It embraces the fractured Part of the Leg.

All these Particulars being placed upon the Bed, the Surgeon orders the Leg to be laid upon the transverse Compress. As the compound Fracture is generally accompanied with a Wound, it is necessary to begin by dressing it with Dozels, and Pledgets of Lint, which is commonly applied dry at the first Dressing. The transverse Compress, and the Tails of the Bandage are moistened, either with warm Wine, Oxycrate, or other Defensive. The Compress is raised on one Side, and passed circularly over the Fracture, to be infolded on the other under the Leg; yet, without shaking it too much, then the opposite End is raised, which is passed over the first, and engaged in the same Manner under the Leg.

The Compress being applied even, the Middle Head of one Side is first raised, it is carried a little obliquely from below upwards, in order to be passed over the fractured Place, then that of the opposite Side is taken, which is continued, and conducted in the same Manner, so that it may cross the

the first: After which we pass on to the superior Heads of both Sides, to do the same, from thence to the inferior, observing to carry them alope, that they may cross one another. The same is done with the second Range of Heads. They must be well moistened, that they may apply exactly.

The two first Rows being thus placed, a longitudinal Compress is put on each Side of the Leg. Some Practitioners apply them simple; but I have always observed a Paste-Board-Splint contained within to be very useful. These Splints are soft, and flexible; being wet in a Defensive, they mould themselves upon the Turns of the Heads, and afterwards recover their ordinary Firmness, which secures them, and hinders the broken Bones from being thrown out, particularly when the Patient is subject to involuntary Startings.

The third Heads of the Bandage are to be raised as the preceding, always beginning with the Middle, and so on with the others. The Surgeon must remember that the first Range is to be shorter than the second, and this than the third. These Gradations allow their being easily taken up, and applied without Deception.

The eighteen-tailed Bandage being applied, the Leg is firm, and secure; and as it must be supported by the two Assistants, during the Application of the whole Apparatus, it is to be raised two Fingers Breadth above the Junks, for the Sake of passing two or three Strings under.

The Leg being placed, two Paste-Boards are put on each Side. Their Extremities are to be hollowed. Their lower Part must be less, on Account of the Smallness of the Leg. They are to be wet in the Liquor, that they may mould to the Convexity of the Bandage.

They must not touch, neither above, nor below, particularly when the Fracture is with a Wound. They are to be fastened with Pieces of Tape, moderately tight. The above is all that respects the Particulars which ought properly to belong to the Fracture.

That the Leg may not move either to one Side, or other, the Junks are rolled; but before they are fastened, four large Compresses are placed between them, and the Leg, to wit, one on each Side of the Condyles, and Malleoli. They must be square, or a Napkin may be folded lengthwise in three, or four Doubles. It's Extremities are of the same Use as the Compresses, and the other Part fills up the Remainder of the Leg. A second is to be placed on the other Side of the Leg. The Junks must press thereon, and be secured

by the Strings laid upon the Sheet; but before it be done, it is proper to lay a longitudinal Compress along the upper Part of the Leg. This prevents the Strings from compressing the Apparatus. The Middle String is tied first, and it is fastened by a Rose-Knot upon the exterior Junk. It is the same with the others. It is proper to observe that the Junks must not extend more than four Fingers Breadth above the Knee.

Although the Leg may seem to be well secured by the Junks, it is necessary to have Recourse to a Sole of very light Wood, or moderately strong Paste-Board. It is to be cut in Form of the Patient's Sole, and covered with a little Mattress, or Compress, a Fingers Breadth thick, and of the same Length. Three Ribands of a sufficient Length are fixed to it, one to each Side, and the other to the superior Extremity. The Sole provided with it's Mattress, must be applied along the Sole of the Foot, where it must be secured by the two middle Strings, and crossed upon the Instep, or else they are passed between the Strings that secure the Junks, and crossed in the same Manner. The third String is likewise passed under the Middle of the Strings, where it is fastened. The Advantage resulting from the Application of the Sole, is that it keeps the Sole of the Foot straight, and at the same Time stretches the Tendo Achillis, which would not otherwise happen; on the contrary, the Tendon contracting, the Foot would remain extended, which would be an Inconvenience after the Cure, because the Patient could only walk upon Tip-Toes.

The forced State the Tendo Achillis would then be in fatigues the Patient, but it is obviated by putting a Pad with a Hole in the Middle under the Patient's Heel; or else we take a Band about an Ell long, and four Fingers broad, which we roll in two equal Heads, and place the Tendo Achillis betwixt both, to support the Heel. If the Patient still finds himself incommoded, a Piece of Sponge may be substituted.

The Apparatus and Bandage being applied, the Leg is raised in order to be inclosed in a Pillow. Care must be taken to guard the under Part of the Ham, that it may not rest hollow. We are likewise to remember to raise the Foot, and inferior Part of the Leg higher than the Thigh, in order to facilitate the Return of the Blood. A Cradle or Bow must be placed, to prevent the Bed-Cloaths from pressing upon the Foot. A Cord is fastened to the Cieling, which is to fall over-against the Patient's Breast. It must be knotted in several Places, or we place a Piece of Wood transversely, that the

the Patient may relieve himself with his Hands. A Log covered with Linen must also be placed at the Foot of the Bed near the sound Foot, that in case his Body falls down, he may be able to raise himself by pressing that Foot against the Log. If the Weather is cold, the Patient's Feet should be covered. The Bleedings, and Regimen, must be regulated according to the Appearance of the Symptoms, &c. What I have said at the Beginning of this Treatise in Relation to Simple and Compound Fractures, both of the Leg and Thigh, may be referred to.

CHAP. IX.

Of the Formation of the Callus.

IN order to a perfect Understanding of the Formation of the Callus, it is necessary first to be reminded, that Nutrition is accomplished by a Kind of Filtration, through the Tender; and spongy Sides of the Extremities of the capillary Arteries, called Lymphatics.

Secondly, That it is the Impetus of the Heart, and Arteries, which propels the nutritive Juice, and engages it within these Vessels, that are very fine, and small, in order to penetrate into the inmost Pores of the Fibres.

Thirdly, That this Engagement is effected by a Sort of Intrusion, wedging in, and strong Cohesion of the nutritive Juices, whose Particles being infinitely attenuated, and moved about in all Directions by the Attrition, at length find Places, where they lodge and fix, applying themselves against one another in their whole Surface, by Means of the continual Pulsation of the Arteries, and that then they remain there perfectly united, and make but one Body.

Fourthly, That Growth is merely effected by the Capillaries, and Fibres of the Periosteum being gradually elongated in every Direction by the Intrusion, and Accumulation, that is made in the Vacancies of these Parts, in Proportion as they leave them. The Periosteum, which is the Support of these Vessels, contributes thereto, since according as the Callus forms, the Lymphatics and Periosteum are entangled more or less in the Ridges, or Network of the Bone, in Form of little Appendices, as it were, Papillæ like, which is very obvious as well in young People, as in young Animals; for by separating the Periosteum from the Surface of the Bone, all those Capillaries

are seen penetrating further than the first, second, and third Tables of the Bone, which has not yet acquired the necessary Hardness. Thus the Productions of the Periosteum, which is equally true of the Vessels, are wedged in there, dry, and enter into the Composition of the Bone; that is the Reason why the Periosteum is thicker in Youth than in advanced Age, which Experience proves in Fractures, that are sooner cured at that Age than in the Adult; which evidently proves this Membrane to be regenerated 'till the Bone has acquired it's last Perfection.

A young Animal therefore requires much Lymph, since from it must be formed the whole Bulk of it's Body; it is likewise true, that the Distribution of the Lymphatics cannot there be determined. But the growing Fibres of the Periosteum, and Lymphatics, would be every Moment exposed to break by Force of Extension, if the supple and connecting Particles of the Lymph were not lodged in the Vacancies, which form, as it were, so many Masles of Network, which by half opening give Admission to fresh ones, which like so many little Wedges support, and bear them up, at the same Time that they separate. In this Manner the bony Parts elongate and grow.

They are regenerated by the same Laws, which is easily proved. First, it has been said, that the Periosteum alone serves as a Mould to all the Bones; that it is it, that supports the nutritive Juices to form the first Layer, or bony Network, and thus alternately, until the Bone has acquired it's full Growth.

Secondly, That after the Periosteum has limited the Figure and Extent of the Bone, it enters insensibly into it's Composition by Prolongations, and that it regenerates.

Thirdly, What still proves it, is that every Bone destitute of it's Periosteum can no longer subsist, unless it receives it's Nourishment from some other Parts, as is observable in Fractures of the Cranium, and in Wounds where these Bones are laid bare, where the dura Mater, which serves them as an internal Periosteum, furnishes them with Juices that are proper for their Nourishment; and very frequently prevents their Exfoliation, though they have been exposed to the Air. But if this obtains in the flat Bones, it is not the same in the Cylindrical; likewise in all Fractures where the Bone has quitted it's natural Place, and is strip'd of it's Periosteum; the most sure Method is generally to saw off this Portion of the Bone, before it be replaced, and this is frequently neglected, violent Extensions being preferred, which tend, as it were, to hasten the Gangrene of the Parts. In such a Case therefore, without
hesitating,

hesitating, the most sure Way to prevent the Symptoms is to amputate the Limb, if possible. Indeed the internal Periosteum of the cylindrical Bones cannot supply the Want of the external, as the dura Mater does in Respect to the Bones of the Cranium. The mere Structure proves it.

In a simple Wound, the Circumstances that respect the Surgeon, being well observed, and the divided Parts being so well joined as to touch in the whole Surface, so that the cut Extremities of the Vessels are applied to one another nearly as they were before, and kept so by a perfect Repose, and then the Vessels having their Diameter, Arrangement, and natural Direction, can receive; and transmit the Fluids, that ought to flow therein, which likewise have their natural Fluidity, and an undisturbed Course. Thus all is disposed to re-establish a proper Intercourse between the Solids and Fluids; we ought not therefore to be surpris'd, if the Juices that come afresh, and are engaged as so many little Wedges in the Interstices of the Fibres, and ruptured Vessels, expand every Way, whereby the Fibres can knit themselves, and the Vessels elongate, and communicate with one another in different Directions, whilst the undisturbed Juices unite them.

Cicatrices show, that there always is a Change in the Direction of many of these Vessels, which differs from those, where the divided Parts are in the natural State. The same Thing happens in simple Fractures.

In a contused Wound, for Instance, the Portion of Vessels, and Fibres that have been entirely lacerated, or contused, is separated by the continual Impulse of the Fluids of the sound Part; as it is softened by the purulent Liquor wherein it swims.

When by Nature, and the Surgeon's Care, such a Wound has been well deterged; that the Humours that formed the Obstructions in the Wound have been totally melted down by the Suppuration; that the distended Parts have permitted the Vessels to recover their Direction, Arrangement, and Diameter; that the Fluids have recovered their usual Fluidity and Softness; then the nutritive Juices resume their Course in Part, whilst a certain Quantity of them is distributed differently, and this is what produces the Cicatrix; their continual Secretion, and at the same Time the Extremities of the cut Fibres and Vessels being fully disengaged, expand equally from all the Points of the Middle, and Sides of the Wound, by the Intrusion of their nutritive Juices, which by their Assemblage form as it were so many little Cones, like little papillary Bodies, of

a vermilion Colour, which are connected together, and communicate with their Neighbours.

By the same Mechanism are the bony Parts nourished, and reproduced.

In a simple Fracture the Surgeon having replaced the Ends of the fractured Bones in their natural Position, and brought them into Apposition, as much as he can; he keeps them so by the Bandage. As the ossific Fibres in this Species of Fractures are simply broken, they have preserved their Direction, and the Fluids their usual Thinness; and, as the Periosteum is not lacerated, nor divided, and is corroborated by the surrounding fleshy Parts, the fractured Pieces cannot separate; and then the Juices proper for the Reunion, which ouze from the lymphatic Vessels, are diffused like Dew on all Sides, and insinuate as well in the Center, as in the Circumference of both Ends of the broken Bone, where they form the Beginning of the Callus, by following the Direction of the bony Fibres, and cement them together; and, as the Periosteum confines the Juices, the Callus is slightly deformed in simple Fractures. If notwithstanding, one of the Ends of the Bone should be displaced, the Marrow contained in it's Canal is compressed, it's Membrane, which is very fine, and thin, is ruptured; the Succus Medullaris quits it's Bounds, and transpires, or mixes with the Mass of Blood by the Mouths of the lymphatic Veins. The Ends of the broken Bones must be confused, consequently the bony Filaments that compose the different Plates of the Body of the Bone must undergo the same Fate as the soft Parts, viz. dissolve, and return to the same they were in at their first Beginning; and, as the Bones are covered in this Kind of Fractures, the Heat which is continual in those Parts occasions the Fluids to acquire more Motion; from whence it follows, that the Juices proper to form the Callus mix with the ossific Matter, which being melted down like Pap, makes a Cement, which cannot be separated, as it is stopt as well by the Periosteum, as the Bandage. This is observed in many Fractures, where the Place of the Callus can with Difficulty be distinguished by the Touch, on Account of the small Space the Juices have had to diffuse themselves.

This same Cement stops up the whole Canal of the divided Pieces. Thus the Marrow, which made but one Continuity in the Canal before the Fracture, is divided. The same may be said of the internal Periosteum, which is likewise destroyed. It is thinner than the external, yet it has the same Uses, and Functions, since it furnishes all the lymphatic Vessels for the internal Part of the Canal, as it's Vessels communicate with those

those of the Marrow, and receives them only from the external Periosteum, and from those in the Neighbourhood of the Joints.

It is proper to be reminded, that the principal Vessels destined for the internal Periosteum and Marrow, pass from without inwards through particular Canals, that go some Lines into the Body of the Bone, and that, if these Vessels should be lacerated at the Time of a Fracture, Accidents may happen, which are difficult to be found out, and which oppose the Formation of the Callus, and are not discovered till after the opening of an Abscess, and by an ouzing of Blood.

Although the Substance of the Bone be compact, Canals quite different from those destined for the Blood Vessels are met with betwixt the Plates, that compose it. They serve to give Passage to the most subtile Part of the Marrow, without which the Bones would be more brittle, particularly when they have acquired their last Growth. An Infinity of Pores is likewise discovered there, which pervade all the Plates in different Directions, and wherein this same Matter insinuates itself, which serves as a Vehicle, or sulphureous Part, to give Firmness to the other Matters that enter into the Composition of the Bone and Callus; it is likewise by it's Mixture with the saline, and earthy Parts, that the spongy Texture is grosser, and more irregularly disposed in Fractures after the Callus is formed.

If a Bone is sawed through at the Callus, the Canal containing the Marrow appears to have no more Continuity, the interior Part of the Callus is denser, than the natural State; the spongy Texture is entirely different from that of other Bones. Nevertheless, there is no Rule without Exception. Indeed a much more spongy Texture is seen in some Fractures than others, which does not prevent such fractured Places from resisting Blows and Falls, more than the rest of the Bones.

If what is advanced should not be authorized by Experience and Practice, yet the Examination of dry Bones would easily convince us of it. For if a fractured Bone is macerated a long Time in Water, and boiled; if it has been in the Earth, or lastly, if it has been exposed to the Injuries of the Air, the callous Place will be found less altered than the rest of the Bone.

As it is impossible to conceive the Formation of any Being whatsoever, every Philosopher has a Right to believe, that nothing new is produced, and that what appears such is only a Regeneration.

The

The nutritive Juice is not capable of giving itself, or communicating any Figure; but it's Softness renders it capable of receiving it from whatever can transmit, contain, and confine it. The Fibres of the Parts, that compose the Animal can be elongated, and enlarged, but not of themselves; it is the nutritive Juices, that renders them capable of all those Changes.

The Parts of the Body are regenerated by a Species of Vegetation, or Shooting forth, so that little Buds are seen rising, which are afterwards changed, and transformed into Parts perfectly similar to those, that produced them. Thus those, that are upon the Bones become bony, and those upon the Flesh, fleshy; which ought to induce us to believe, that this Regeneration is no more in Fact than an Insinuation of the nutritive Juices into little Sacs, or Papillæ of Flesh and Bone, which already existed, though invisible, and which were unfolded by being thus filled.

Incarnation, and the Formation of the Callus, are only then an unfolding similar to that produced during the Growth of young Animals, except that it is not effected with the same Facility, Order, or Regularity. It is a pure Work of Nature. Let the Surgeon on his Part then only preserve the Rectitude of the Fibres as much as he can, by keeping the Bones well adjusted, and only permit the Callus to rise as high as is necessary to preserve it's Level equal to that of the sound Bone, let him subject it properly, let him but endeavour to nourish the Patient with Aliments, that fill the nutritive Juice with soft, even, and flat Parts; Nature and Time, which are of such great Use, will do the rest, viz. the Callus will harden gradually by the strong Cohesion of the Particles of the nutritive Juice, and by the close Union of the Filaments of the Periosteum, and Extremities of the Vessels. For nothing is so proper to render a Body hard as an Assemblage of Parts that are fine, small, flat, and properly interwoven. Thus a Cloath is so much the closer, if it has been composed of the finest Threads, and the most closely struck. This close Union of the Fibres of the Callus depends upon the Pulsation of the Vessels, the Spring and Friction of the neighbouring Solids, and the continual Impulsion of the fresh Juices. All those Causes are as so many Strokes of an Embolus, which continually strike these Fibres, and which close them more and more.

In simple Fractures after the seventh Day, and when there is nothing more to be feared, it is necessary to abate the strict Diet the Patient has been ordered to observe, and to allow him Nutrient solid, and proper for his Constitution, and Man-
ner

ner of Living. Without this Precaution, the Callus would be a long Time in forming; and this ought to be particularly observed in the military Hospitals, where the Broths are not nourishing enough to serve as the sole Aliment to the poor wounded, whose Blood is greatly impoverished, and deprived of it's balsamic, and gelatinous Particles.

In compound Fractures the Regimen cannot be slackened 'till after the twenty-first Day, that is, when the Time of Abscesses is over, or when the other Symptoms, that occasioned the Complication, are appeased.

Nature supported by a more juicy Nutriment, will be more active, the Regeneration of the Flesh more easy, the Formation of the Callus quicker, and the whole fractured Limb will become stronger, and more proper for the Motions it is destined to.

In simple Fractures, nothing so much opposes the Formation of the Callus as a too tight Bandage, and in compound, as the Alteration of the Ends of the broken Bone, whether it be owing to the Impression of an external Cause, or to the Action of the purulent Matter, that has lodged upon the fractured Place, because those Ends must exfoliate more or less, according to the Depth of their Alteration, which requires a considerable Time.

Some pretend that there are Specifics for the Generation of the Callus, and the Stone called Osteocolia is particularly cried up; but it is an Error, whereof they are undeceived.

There is room to believe, that Nourishment contains the best Specifics to produce it. The Blood, daily accustomed to nourish the Parts, and give them their just Size, will restore them what they shall have lost, as much as possible, if by a proper Treatment, and bland Aliments, their Rectitude, Directions, natural Diameter, and Suppleness be preserved, so that they may receive in their Interstices as much as may be of this white mucilaginous Juice, that ought to make them grow, and elongate.

The Induration of the Callus may be assisted by Lotions of Aromatic Wine. Compresses moistened in it are also applied, and kept on by a Bandage purely contentive. But Oils, and Fat must be avoided during the hardening of the Callus.

If both Ends of the fractured Bone could be so exactly brought into Apposition, that the Fibres of the one might answer to those of the other, the Callus would be so thin, and the Ring that surrounds it so small, that in passing one's Finger over the broken Place, no Unevenness would be perceived, as is seen in Fractures, where the Bone is fractured cleanly, and
whose

whose Pieces have preserved their Level exactly, which it is easy to conceive. Indeed the Periosteum has suffered no Disorder, and the Lymphatic Vessels, that furnish the Matter of the Callus have preserved their Directions; thus the broken Place forms an Eminence imperceptible to the Touch.

As to the Time, that Nature assisted by Art, takes to unite the different Bones in simple Fractures that are treated properly, we are convinced by the Observations of the most famous Practitioners, both antient and modern, that the Bones of the Nose, Jaws, Clavicles, Scapulæ, Ribs, Tarsus, Carpus, and Fingers, are reunited in twenty-five or thirty Days, the Bones of the Fore-Arm and Legs, in thirty and forty; the Humerus in forty, or forty-five; but as to the Reunion of the Femur sixty Days are necessary for the Cure.

This Inequality of Time proceeds from the different Texture of the Bones; the Callus being sooner formed in those that are only covered with a very thin Plate, and whose whole internal Part is spongy, than in those that are very thick, and of a very compact, and close Texture; and it is likewise for the same Reason that the Callus is formed sooner in young than in old Subjects. It may be added, that the Callus of the large Bones in Children is produced proportionably quicker, because the Periosteum is thicker, and beset with more Vessels, which accelerates the Formation. It is not the same in the Adult.

The Time just noted suffices for the perfect Cure of the Disease, but not for the compleat Cure of the Patient, that is, that he may use the broken Limb, boldly and safely; for Instance, if it is the Thigh, or the Leg, that he may safely trust the whole Body upon it. For which Reason he ought to make use of two Crutches for a certain Time; then one and a Cane; and lastly, of one Cane only. It would even be proper to make him keep the Bed, as long as possible. This Time would be well employed, because the fractured Limb would so much the more easily recover it's Strength and Vigour, and the Muscles the Freedom of their Motion.

It is also proper to remark, that if it has been necessary to keep the Bandage loose for the first Days, and to leave the Parts in a Manner free, in Consequence of the Accidents that have accompanied or supervened the Fracture, it ought not to be pretended, that the Callus acquires it's Perfection so quickly as if free from Accidents. For Example, if during the Treatment an Erysipelas, or violent Diarrhæa has supervened, which shall have taken off a Part of the Nutriment, the Cure will undoubtedly be longer; if the Patient's Blood is too much dissolved,

solved, or it be too viscid, the Callus ought not to be expected to form, as quickly as in a Subject in a proper State.

We are sure that the Fracture is properly cured, when the Time necessary for the Induration of the Callus being expired, by comparing the Part that has been fractured with the sound, they appear perfectly similar in their Figure, Length, and Conformation, in sliding the Thumb over the fractured Place, neither Eminence, Cavity, nor any extraordinary Unevenness is felt, and the Patient begins to move the wounded Part a little, and if it is the Leg to support himself upon it without suffering any considerable Pain. On the contrary, there is Room to apprehend that the Fracture has not been well reduced, if after the Expiration of the Time of the Cure, the broken Part being compared with the sound, appears deformed at the broken Place, and if any considerable Unevennesses are discovered, and if the Patient feels violent Pains as soon as he tries to move the Part, and support himself upon it. Then there is Reason to suppose, either that the Fracture has been badly reduced, or that the broken Pieces have quitted the proper Situation they were put in, either through the Surgeon's Neglect to visit his Patient frequently enough, or through the Liberty the Patient has taken to move it too soon; or because the Greatness of the Disease may not have permitted the Surgeon to put Things in a better State, notwithstanding all the Care that he was capable of applying thereto during the whole Course of the Treatment.

The Inequality of the Callus does not commonly depend upon a loose Bandage, it ought to be attributed essentially to the Laceration of the Periosteum, which alone furnishes the Vessels for it's Regeneration. These Vessels being thus divided, the Juices do not find themselves stopped, and they are distributed irregularly, as is seen in oblique Fractures of the Thigh, and in those that happen near it's Neck.

This last Circumstance ought to be maturely weighed in Science, Equity, and Charity, in the Reports that are necessary to be made in Courts of Justice.

It is easy to infer from what has been just said, that the Irregularity of the Callus depends upon several Causes; first upon a too loose Bandage; in this Case the nutritive Juices are diffused, and the Fibres of the Periosteum, and Vessels elongate more or less irregularly. In order to restrain them, the first Band must make three circular Turns upon the fractured Place, and the second two. Thus are we daily obliged to restrain the Flesh, and prevent it's rising too high so as to preserve the Level of the Cicatrix equal to that of the Skin.

This

This Irregularity may likewise proceed from the Situation of the Fracture, as when it is with Splinters near the Trochanters, upon Account of the great Dilacerations of the Periosteum; for it is very difficult to adjust them well, by Reason of the Thickness of the Flesh.

This Irregularity may also be owing to the Figure of the Fracture, as when it is oblique, as before-mentioned, or when there has been a Loss of the Substance of the Bone. It again depends upon the bad Configuration that has been given the injured Part, the Restlessness or Impatience of the Patient, or upon the Nature of the supervening Disease, as an ardent Fever, or a Delirium, &c.

It may, lastly, be owing to the Number, Size, and Situation of the Shivers, especially if they have been forced very deep into the fleshy Parts. In such a Case, they produce Abscesses, which during the Suppuration, destroy, vitiate, or soften the Callus.

When the Surgeon perceives the Callus to be sufficiently hard, he ought to order the common Motions to be made to the Part for fear of an Ankylosis, always keeping the fractured Part well secured. If it is the Elbow, it is bent, and extended; if the Thigh, it is to be moved in the same Manner, and rolled in it's Cavity.

It cannot be too much recommended to young Surgeons, and Patients to keep the fractured Part extremely still. Nothing so much prevents the Formation of the Callus as the moving the Part by the Patient, or Surgeon. We frequently see that by this bad Treatment each End of the broken Bone dries, and becomes callous.

The Necessity of this is fully proved by the following Observation.

OBSERVATION.

A Man, in falling, fractured the Fore-Arm four Fingers Breadth from the Wrist, so that both the Radius, and Ulna were broken transversely, and totally divided. Surgeons were immediately called to reduce this Fracture, but the Man would not allow himself to be touched, and told them he should be cured without their Assistance, and Bandage. He went about his Business as usual, and made use of his Arm and Hand, as much as he possibly could. At length by these frequent Motions, the Ends of each cemented separately. They were bound by Membranes, that were Prolongations of the neighbouring Parts.

We

We have said in the Theory of Fractures, that both Bones of the Fore-Arm being fractured, those Motions could be no longer performed regularly, as well because the Support of the inferior Piece of the Fracture was become unsteady, as by Reason of the Pain the Limb was in by the continual Displacing of the Ends of the broken Bone, and that it was the same with the Motions of the Wrist, and Hand. Indeed, when this Man bent the Elbow, the whole inferior Extremity of the Fracture was thrown outwards, and when he extended it, it made an Angle in a different Direction; when he took hold of this Part of the Fracture with the sound Hand, he could move it outwards and inwards, which imitated the Motions of Flexion, and Extension. The Singularity in this Kind of Fracture was, that the Motions of the inferior Piece were slightly irregular, because the Pieces were, as it were, articulated, and retained by Sorts of Ligaments, and besides, were provided with little Eminences, and Cavities, proper to lodge one another in, and bound by Membranes, that were Prolongations of the neighbouring Parts, whereby the Pieces separated little, and were not beset with Points, which occasioned the Patient to feel no Pain.

Fabricius Hildanus relates a Case nearly similar in the ninety first Observation of the third Century.

A young Physician, whose Name was Sylvester, having seen those two Bones at my House, immediately imagined, that a new Articulation was formed at the fractured Place, and that this Man could bend the Fore-Arm in two Places. He established a new System upon this false Principle; and having desired me to lend him the Part for some Days, he had it engraved, and communicated this Observation with his Remarks to Mr. Bayle, Author of the Journals entitled, the Republic of Letters; but the whole of this System is destroyed by the mere Inspection of the Part. It is certain, that the Eminences and superficial Cavities remarked at the Ends of fractured Bones, have no Disposition to be set in mutually, and it is certain that they had no particular Motion, but only obeyed those of the Wrist, as has been said.

This Observation shows, how necessary it is for the Re-union of Bones to confine the fractured Parts by Bandages, and keep them extremely still.

But, if from any Cause whatsoever the Ends of each Bone should be re-united separately, to obviate this Inconvenience, the Callus being recent, it is recommended that both Ends of the fractured Bones be rubbed against each other, in order to wear, and destroy the Extremities of the bony Fibres, to facilitate

cilitate the nutritive Juices, cementing them together by a fresh Callus; but this Operation is only good in the Study, for however the whole End of the cemented Bone be rubbed, it is useless and even dangerous for the Patient.

When the Callus is fully hardened, there is no Remedy left, nevertheless, if that happened to the Leg, a Boot might be made use of to bind both Pieces, as well as possible.

If through the Patient, or Surgeon's Fault, the Bones are so reunited, that they have passed, the one upon the other, or they be awry, when the Callus is recent, and still soft, moderate Extensions may be made, and Attempts tried to replace the Pieces with the Palms of the Hands.

If a Wound should prevent Extensions, and Counter Extensions from being undertaken, that the Callus which has not yet acquired it's perfect Solidity may be divided, the Wound might be enlarged, the reunited Bones laid bare, and the Callus made to exfoliate.

The End of Book I.

THE SECOND BOOK, OF LUXATIONS.

CHAP. I.

Of Luxations in general.

THERE are three Kinds of bony Parts in the human Body, that are capable of Separation.

The first are the articulated without Motion, as the Pieces of the Cranium; but this Separation is only incident to Children; where the Tenons, and Mortises, that compose the Sutures, being still flexible, tender, and membranous, can yield, and obey the Effort, that forces them from within outwards, as is seen in the Hydrocephali of Children; for in Adults, the Water extravasated in the Ventricles occasions no Separation.

The Cranium of Children in this Disease may become exceeding large, and I have seen some, that were three Feet in Circumference.

In order to a clear Explanation how the Pieces of the Cranium dilate, and stretch out in so extraordinary a Manner, it is necessary first to remark, that in the Fœtus, the Substance of the Bones is yet tender, especially in the Cranium, and that all the Pieces composing it are supple, and membranous at their Point of Juncture; secondly, that in the Adult, the Bones have acquired their last Degree of Hardness, and that at their Junctions, they are cut into an infinite Number of little Points, which are like so many Tenons unequal in Length, and Breadth, betwixt which are a Number of Mortises, wherein the Tenons are enchased mutually from both Parts.

The Firmness of the Junction of the Bones of the Cranium depends likewise upon the Situation, and Figure of some of the Tenons, some being situated obliquely in their Mortises, and others cut in Form of a Dove's Tail. In some

Sutures there are even little long Bones, that cross them, and join the two Pieces in which they are engaged, in the same Manner as in Joinery a Screw binds two Boards together.

It is apparent from what has been said, that there is a great Difference between the Cranium of a Fœtus, and that of an Adult, as well upon account of the Bones, as of their Junction.

Let us now examine how each Piece dilates, and stretches out in so extraordinary a Manner in the Cranium of those attacked with the Hydrocephalus.

This Dilatation depends upon two Causes; first, the Softness of the Bones; secondly, the Defect of their Junction: For, instead of being enchased in one another by very long Tenons, and deep Mortises, as is seen in Adults, there is only a simple Membrane at each Suture that connects them.

Let us now consider, that the Water acts not only by it's Weight, but likewise by it's Fluidity, viz. by it's Property, as it is compounded of Particles, that move in all Directions, whereby Bodies exposed to it's Action are prest on all Sides. Let us again consider, that a large Quantity of Water has always been met with in the Ventricles of the Brain in all the Hydrocephali, that have been opened. Vesalius relates, that being at Augsbourg, he opened the Head of a Girl two Years old with an Hydrocephalus, and found the Cranium entirely soft, and ten Pints of Water in the Ventricles of the Brain. This being granted, it is easy to conceive, that the Substance of the Cranium of a Fœtus, and very young Children, being soft and tender, and all the Junctions purely membranous, it must necessarily obey the Force of the Fluid contained in the Ventricles of the Brain; for we know, the Equilibrium of Fluids being ascertained, the Force of a Fluid, in dilating a large Vessel, when pushed through a narrow Canal, and being incessantly propelled from the inner to the outer Part of the Cranium, each Piece composing it must be dilated, and stretched out; and if any Place is weaker, it must yield the more; this is likewise proved by Experience; for Children are seen whose frontal and parietal Bones are exceeding large, because they being softer, and leaving a large Space betwixt them purely membranous, called the Bregma, must more easily obey the Action of the Water contained in the Ventricles. This is the Reason, that the prodigious Bulk of the Cranium depends chiefly upon the Dilatation of the parietal, and frontal Bones.

If it be considered, that the Water contained in the Ventricles, rendering the Vessels that compose the membranous Parts of these Bones more supple, prevents their Fibres from harden-

hardening, and consequently from ossifying; it will not be surprizing, that the Pieces of the Bones are less hard in Proportion to their Age than those of other Subjects, and that the Ossification has been hindered in several Places, especially in the parietal Bones, where many Places are seen entirely membranous.

It is easy to judge, that the Parts of the Cranium of Adults cannot suffer the same Separation in Consequence of Water extravasated in the Cavities of the Brain. Indeed that is absolutely impossible, because the Pieces are closely and firmly joined, and have acquired their last Degree of Hardness. But as the Waters extravasated in the Ventricles of the Brain have no Vent, and the Pieces of the Cranium cannot stretch, their Extravasation always causes a Lethargy, or a mortal Apoplexy, as Experience demonstrates.

The Pieces of the Cranium cannot then separate, nor the Sutures half open, except by violent Blows, or Falls, &c. which fracture the Cranium in some Place, and break the Tendons, and Keys serving to join the Pieces. There are such Instances where the Sutures are separated, particularly the Sagittal, and where the Patients are nevertheless perfectly cured.

It is proper to shew, that the Symptoms accompanying the Hydrocephalus in the Adult, are different from those of the Hydrocephalus of Children. In the last the Extravasation is very great, by Reason of the Separation of the Pieces; consequently they are stupid, their Head hangs downward, they are very drowsy, without Sense, and even lose their Sight. In the Adult the Hydrocephalus causes intolerable Pains, the Patient is very uneasy at the Beginning of the Disease, he gradually loses his Memory, his Eyes become wild, he is seized with Drowsiness, and is tormented with Dreams, which throw him into Startings; Symptoms that continue even to Death. Here is an Instance of a singular Hydrocephalus.

OBSERVATION I.

I Opened a Child eight or nine Years of Age, where the Bones of the Cranium, namely the frontal, parietals, and occipital were above two Lines thick. The Dura Mater was so closely attached to their Surface, that I was obliged to cut it in the whole Circumference of the Cranium. Near three Pints of a clear Water without Smell discharged from thence. I found no Part of the Brain in this Cavity, except the Medulla oblongata, which rose from an Eminence placed in the Center of the Sella Turcica. The optic Nerves were not as large as they generally are at this Age. Finally, all the other Parts of the Body were in a proper State. The Child was plump,

180
it's Eyes appeared smaller than common. I could not learn, whether or no, the Faculties of the Sight and Speech were incapable of their Duty; but as for the animal Functions, there is Room to believe, they were performed, since the Child lived to such an Age.

The second bony Pieces, that may be separated are the Epiphyfes, which, though joined in young Subjects to the Body of the Bone by a Cartilage, and a Kind of Suture, may nevertheless separate without Fracture, as is seen in the Scurvy, and an inveterate Pox.

Besides the Epiphyfes, the bony Pieces united by Synchondrosis, viz. by Cartilages, as the Ossa Pubis are with each other, the Ossa Iliæ with the Os Sacrum, the Bodies of the Vertebrae, &c. All these Pieces, I say, may be separated, as well on Account of the Suppleness of their Cartilage, which allows them to stretch, and separate by an extreme Violence, as by Reason of the Relaxation of their Ligaments, or else because the Cartilage enlarging more in one Place than in another, acts as a Wedge, which divides the two Parts. The Greeks have called this Species of Dislocation *Diastrasis*, and we in our Language call it Separation.

These Pieces may be likewise totally separated by some violent Force, which detaches the Cartilage. These Diseases are always mortal.

Such Separations, or Displacing of Parts, ought not to be referred to Luxations, since there is neither Head, nor Cavity out of their natural Place. We therefore speak improperly, when we say in such a Case, that the Bodies of the Vertebrae have been luxated, and that Word is only proper to the Displacement of their oblique Processes, which are really articulated with one another.

The Case is not the same with the Separations of the Radius and Ulna; because these Parts are really articulated, and not cemented, as before mentioned, where they touch. As to the Separation of the Fibula, it is commonly called *Diastrasis*, because this Bone, though articulated, is so closely bound against the Tibia, that it's Junction is considered as a Symphysis.

The Ossa Iliæ have been found separated from the Os Sacrum, and the Ossa Pubis from each other, by violent Efforts, and the Bodies of the Vertebrae have likewise been forced outwards, inwards, or laterally, according to the different Species of Crookedness, as will be afterwards explained.

The third Pieces, that may be separated are the Heads, and Processes of Parts articulated with Motion which quit the Cavities

ties wherein they were naturally lodged. It is only these last, that I would be understood to mean, when I say the Bones are luxated, or dislocated, and to them I shall chiefly confine myself.

The Differences of Luxations are taken, either from the Manner, how the moveable Part is displaced, or from the attending Symptoms.

As to the Manner how the Displacing is affected, Luxations may be divided into compleat, and incompleat.

In all Articulations by Enarthrosis, a Luxation, where the Head of the Bone is entirely out of it's natural Cavity, ought to be called compleat; and incompleat, when it is still upon the Edge of the Cavity, so as to be just ready to quit it.

In all Ginglimoid, or Hinge-Articulations, a Luxation is called compleat, where the Heads, and Cavities, are absolutely out of their Places, and incompleat when one of the Heads of the Joint quits it's Place to take that of the other; so that one of these Heads is totally forced upon the right, or left Side.

We will show, that the Luxations of Bones articulated by Enarthrosis, are almost always compleat, and the Ginglimoid, or Hinge-Articulations, almost always incompleat.

The Reason of this is evident. It cannot be supposed that a round, and polished Head, like that of Articulations by Enarthrosis, can remain long upon the Edge of it's Cavity, for it either re-enters, or quits it entirely, which is contrary to ginglimoid, or hinge ones, especially those whose Surface is very large, which can scarcely ever be luxated entirely by an external Force without great Risque of the Patient's Life; or at least of the Loss of the Limb. The Reason of this is that, these Bones having a much greater Surface at their Junction than those articulated by Enarthrosis, they cannot make so long a Tour, and entirely quit their natural Place without an extreme Force, and lacerating the Muscles, Ligaments, Vessels, and Teguments very much, whereby in the Attempts to reduce them, Convulsions come on, and in the Failure a Fever, and Gangrene generally supervene. This is certain. All good Practitioners are convinced that Luxations, and chiefly that of the Elbow, Leg, and Foot, cannot happen without that Accident.

The Causes of Luxations are internal, or external.

The last are Blows, Falls, and other violent Shocks, whose Action is greatly assisted, and as it were, directed by the different Situations the Limbs are in at the Instant of the Luxation, as will be explained.

The internal Causes are generally hid from our Eyes, and are only known by the Diseases preceding them. A Paralysis contributes thereto. It happens sometimes that in certain Mo-

When the Ligaments are relaxed, and the Luxation happens suddenly. The Change of the Head of a spherical Bone received in a Cavity proportioned to it's Diameter, and whose Bulk increases insensibly, is another; the Head is forced out of it's Cavity, and if it remains so, an Ankylosis comes on. The Inspissation of the Synovia is a Cause, but that takes some Time in effecting, especially in People who live in moist Places. Convulsions of long Continuance, and other violent Contractions of the Muscles, are a third Cause of Luxation. For Instance, the Jaw may be dislocated by a too large Gape. Such likewise is the Relaxation of the Joints, owing to the Weakness of the Ligaments, and surrounding Muscles.

In order to a clear Comprehension of the bad Consequences of these two last Causes, we must first consider the Ligaments as a Sort of Cords, cut, and figured variously, according to the different Species of Articulations, which by their firm, and compact Texture keep the Heads of the Bones in their Cavities, and strengthen the Joints.

Secondly, we ought to consider that, besides these Bands, the Tendons of the Muscles, which commonly embrace the Joint, are like so many Cords, serving to retain the Head of the Bone in it's Cavity. For as the Fibres of the Muscles are in continual Tension, even when the Muscles are inactive, as is seen when one of the Antagonists is cut, or paralytic; the Effort they make in pulling against one another to keep in Equilibrio, tends to keep the Head of the Bone in it's Cavity. It may be then asserted, that the Muscles contain the Head of the Bone by pushing it into it's Cavity by their natural Elasticity, which acts always, and by supporting the Limb, which by it's Weight would certainly force, and drag the Head out of it's Cavity.

It is obvious from what has been said, that the Ligaments, being relaxed by the Lymph, which moistens them, they can no longer keep the Heads of the Bones in their Places. These Species of Luxations frequently happen to those who are subject to Catarrhs, and those who live, or lay in moist and marshy Places, as already mentioned; and if a Paralysis of the Limbs should be joined with the above Cause, it is still more easily luxated.

The Swelling of the Ligaments of a Joint may likewise force the Head of the Bone more or less out of it's Cavity. Lastly, the Coagulation, and Inspissation of the Synovia within the Joint, which changes into a Kind of Plaister, or Stone, by pushing the Head of the Bone gradually, forces it to quit it's

its Cavity. We see this happen to those, who are subject to the Gout, and Sciatica.

From whence it is clear, that the Head of the Bone is displaced in four Ways by an internal Cause.

The first is the simple Relaxation of the Ligaments; the second is their Relaxation with Paralysis; the third is their mere Swelling; the fourth is the Coagulation of the Synovia of the Joint.

Lastly, the Head of a Bone may be larger, or smaller than the Cavity wherein it ought to be naturally received. I might likewise give as a Cause of Luxation, the Shocks, or Collision, that the Head of the Bone might suffer, at the Time of a Fall, which frequently occasions the Luxation, without our knowing what to attribute it to.

Kerkringius relates an Example of it in the sixty-first Observation. He there speaks of an incurable Luxation of the Femur, because the Acetabulum was much larger than the Head of the Femur. Subjects have likewise been seen, whose *Ossa innominata* had no Cavity.

The Signs of Luxations are either common, or proper.

The first are Pain, and an entire, or partial Loss of Motion in the luxated Limb; but the Pain is a very doubtful Sign, because, though every luxated Limb be painful, yet every painful Part is not luxated, because the Pain may proceed from many other Causes. Secondly, a Tumor appears where the Head of the Bone is placed, and a Depression at the Place of the Cavity; but it is very difficult to distinguish either clearly by Reason of the Thickness of the Muscles, and Teguments, or the great Contusion of the Part, particularly in Luxations of the Arm, and Thigh. Thirdly, the luxated Limb is either longer, or shorter than the sound. Indeed it is seldom as long, except in incompleat lateral Luxations of ginglymoid Articulations, wherein it is equal to the sound, or in compleat ones by Enarthrosis. Fourthly, the most certain Sign, is the Figure of the Part, which is always different from that of the sound. This Figure is not the same in all Species of Luxations, nevertheless it may be determined by the following Rule, which is applicable to all Species of Dislocations.

In all Luxations of Parts articulated either by Enarthrosis, or Ginglymus, the Muscles of the opposite Side of the Luxation are always further removed from the Center of their Motion, and consequently in greater Tension than the others, whereby the Extremity of the dislocated Part is always turned to the opposite Side of the Luxation, so that, if the End of the Bone is thrown outwards, the Luxation is inwards; and if it

is thrown inwards, the Dislocation is outwards, and thus of the others.

It should seem, that incompleat and lateral Luxations of the Elbow could not come under this Rule, because there are no Muscles that can move it laterally; but if it is considered, that, in this Luxation, the Ulna changes it's Support, and is removed from the Direction of the Muscles, they must be drawn more to the opposite Side of the Luxation, whereby the inferior Extremity of the Ulna will be drawn outwards, if the Dislocation is inwards, &c.

It is a general Rule, that the Muscles are always more extended on the Side opposite to that where the Support of the Bone is thrown.

Let us now proceed to the Signs of Luxations from an internal Cause, and begin with those, that accompany the simple Relaxation of the Ligaments.

The Dislocation owing to the simple Relaxation of the Ligaments, is ascertained by the Head being unsteady, and playing, as it were, in it's Cavity, at every Motion of the Part, which happens more or less, according to the different Degrees of this Relaxation, which is sometimes so great, that a Vacuity large enough to receive the End of one's Finger may be felt quite round the Joint. Likewise when the Head of the Bone is pushed back into it's Cavity, it re-enters easily, but it only remains there whilst the Part is kept still, for it falls out again upon the first Motion.

When there is a Relaxation of the Ligaments with Paralysis, the Luxation is produced by the mere Weight of the Part, and has it's different Degrees like the preceding, and, what distinguishes it from the former is, that it is easily replaced, and falls out again immediately, because it is not supported by the Muscles, as in the preceding Luxation.

If the Luxation is occasioned by the Swelling of the Ligaments, great Pain is felt in the Joint, which increases at every Motion of the Part; the Joint appears more prominent, and it is moved indifferently on every Side, because the Muscles are equally removed from their Center.

If the Dislocation is owing to the Coagulation of the Synovia, which by it's Stay has acquired more Consistence, the Joint is distended, and moveable in all Directions, as in the preceding Luxation, but without Pain.

In Regard to the Accidents, a Luxation is divided into simple and compound. That is called simple, which is free from any bad Accident; and compound, when accompanied with Wounds, Fracture, great Contusions, Ecchymoses, Convulsions,

sions, Paralysis. The dislocated Part is frequently inflamed and benumbed. Neglected Luxations are exposed to a Gangrene, Cluquitis, Ankylosis, and are incurable.

Nothing more remains to be spoken of but the Prognostic, before we proceed to the Manner of treating them.

We will begin with Luxations from an internal Cause.

These Species of Luxations are generally very difficult to be cured, and they may be said to be almost always incurable. They are easily replaced, but very difficultly secured, for the Ligaments and Muscles, must have their natural Spring restored, which is entirely weakened.

In Luxations, where there is any hardened Plaistry, or viscid Matter, that fills up the Cavity of the Joint, we are, before we reduce them, to melt down, and resolve it, and restore the Ligaments and Tendons to their natural Force, which is very difficult, if not to say impossible.

In order to treat these Sorts of Luxations, as is proper to each in particular, we are to attend to the different Alterations of the Ligaments.

These consist, either in their too great Elongation, which is different according to the Variety of Causes producing it, as before-mentioned; or in their Relaxation, or Induration, which is commonly preceded by their Elongation, or in their simple Weakness, which is merely owing to the Defect of Nutriment, as in long Diseases; or lastly, in the Erosion of their Texture, occasioned by some purulent Matter. The Means that ought to be employed to remedy their Elongation shall be explained, when I speak of Luxations from an external Cause.

In order to remedy their Relaxation, when produced by foreign Humors, it is necessary to keep the Part reduced by proper Bandages, and to make use of Hydragogue Purges. All those that are extracted from Jalap, Scammony, and Mercury are of great Service. Internally Sudorifics mixed with nervous Medicines, and replete with a volatile oily aromatic Salt are very useful, as also Ptisans made with the sudorific Woods, for Instance, Sassafras, Sarsapparel. Rad. Chinæ. Acrid Sulphureous Diuretics are also successfully given, as Sp. Sal. Ammoniac, et Urin.

During the Use of these Remedies, Aromatic Wines, or Fomentations made with Absinth. Salvia, Rosmarin, Scordium, Bacc. Junip. Sal. Ammoniac, and Camphor, are applied externally. A Bath, or pouring the Sediment of warm mineral Waters, or Stoves, are very useful; or else the Part may be sweated

sweated by the Vapour of Sp. Vin. or lastly, fuminated with Mastic. and Succin.

The Emplastr. Crollii dissolved with Ol. Tart. or Ol. Later. is usefully employed; and Care is always to be taken, that the Patient's Nutriment be dry, and suited to carry off the superfluous Moisture by Perspiration, or absorb it.

If a Paralysis, or any long Disease has occasioned this Relaxation of the Ligaments, antiparalytic Remedies must be joined to those already proposed; and, in order to bring back the nutritive Juices into the most remote Parts of the Body, the Blood and Spirits must be animated by a succulent, and spirituous Nutriment, to which must be joined every Thing that can purify, and thin the Blood. Repeated Frictions, and of long Continuance, with the Ung. Mercur. are very useful.

Lastly, in order to treat the Relaxations of the Joints, the last Observation of the sixth Century of Fabricius Hildanus may be consulted, where he relates all the Remedies he has employed to cure a Luxation of the Thigh, occasioned by a Fluxion. He at first remarks, that in such a Case too hot, or too acrid Remedies, as Sinap. Pyrethr. Euphorb. and other Seeds of this Nature must not be employed. He says, that, while we imagine to restore Plumpness to the Part, which is thin and meagre, it is only puffed up, and filled with a foreign Humor, which increases the Disease 'till it becomes incurable. He also forbids the Use of Grease; and above all, recommends the rubbing of the Part with Ol. Lumbricor.

If the Ligaments, after being elongated, are hardened, and their Pores be obstructed with a viscous and plaistery Matter, similar to that, which occupies the Cavity of the Bone, then their Fibres are hard and stiff. In that Case, other Remedies are to be made use of, viz. all those that dissolve, and attenuate the thick viscous Matters, that are diffused in the Blood and Part. To this End one may make good use of all those, that I shall propose when I treat of the Ankylosis.

Lastly, the Texture of the Ligaments may be lacerated by some violent Effort, or eroded by the Lodgment of some purulent Matter. All Luxations of this Sort are incurable.

As for Luxations from an external Cause, it is necessary first to observe, that they are not mortal in themselves, but solely so by Reason of the Compression of the displaced bony Parts upon the Blood Vessels, Nerves, Tendons, and Ligaments of the Joint, or on Account of their Laceration. The Pain and Swelling of the lacerated Part are likewise to be considered.

All Luxations of the Thigh are, generally speaking, more rarely

rarely cured than others, especially if they are old, as well because the Ligament, that keeps the Head of the Femur in it's Cavity, loses it's Elasticity by it's too great Elongation, as by Reason of the Viscosities, that fill up the Cavity, whereby the reduced Thigh falls out, and luxates afresh, whereto it's own proper Weight contributes greatly. If the Ligament within the Cavity is ruptured, the Dislocation is supposed incurable, because it is imagined it cannot be reunited; nevertheless, if the Tendons, Cartilages, and fractured Bones reunite, for much better Reason must the Ligaments.

In the Luxations of the Thigh where the Head of the Bone is lodged under the Os Pubis, the Patients suffer much, the injured Part wastes, and they die a languishing Death. The Head of the Femur by compressing the Nerves and Tendons, causes all these Accidents. When it presses directly upon the spermatic Cord, the Pains are more acute, and the Patient dies sooner.

When the Dislocation of the Elbow is neglected, it occasions terrible Accidents. I will give you my Thoughts on that Disease, when I speak of it in particular.

Luxations of the Knee, when compleat, are very dangerous, difficult to be reduced, and most frequently mortal, if not remedied before the Symptoms; which Article will likewise be explained in its proper Place.

Dislocations of the Phalanges, when they over-ride one another, are so difficult, that it is almost impossible to reduce them.

Luxations are very terrible, when the Edges of the Cavities destined to receive the Heads of the Bones are fractured, or shivered, because the reduced Bones can no more remain in them, and they luxate upon the least fresh Effort.

The compleat Luxation of the Jaw is frequently accompanied with very bad Symptoms, as Fever, Convulsions, Delirium, &c.

Old Dislocations in whose Cavities is collected a stony and plaistry Matter, are incurable. Those where the Joint is choaked up with very thick Viscosities, are very troublesome, and tedious in the Cure.

From whence it appears, that luxated Bones ought to be reduced as soon as possible; and that when the Reduction has been neglected, at first, or could not be effected, then we are to wait, till the Inflammation, and other Symptoms cease.

It is farther obvious from what has been said, that all Dislocations from an external Cause are not equally easy to be reduced, and that for many Reasons.

First,

First, The compleat Luxations of ginglymoid Articulations, and those that are old, are much more difficult to be reduced than others, for the Reasons that shall be related elsewhere.

Secondly, When a Bone remains long out of it's natural Cavity, besides the Viscosities that collect, and inspissate therein, the Tendons that have been obliged to remain long inactive, and in the same Situation, become so stiff, that they no longer stretch, nor obey the Extension of the Part.

Thirdly, It is much more difficult to make the necessary Extensions to reduce a Luxation accompanied with Fracture, Wound, Ulcer, &c. than if free from these Accidents, especially if the Fracture is near the Joint.

When there is a Fracture with Luxation, the dislocated Bone is always to be reduced before the Fracture. If it is in the Joint, the Luxation is much more difficult to be reduced, and the Callus that forms there, almost always renders the Part immovable, as will be shown in the Sequel.

Joints that are dry are very troublesome to be reduced. By the Word Dryness, I do not mean that, which is owing to a Defect of Nutriment, or to the Extravasation of the Synovia, but that which the Ligaments and Tendons of the Joint have contracted by Labour and Exercise, which renders them stiff and hard; and that is the Reason why the luxated Bones of Labourers are so difficult to be reduced.

Dislocations accompanied with great Inflammation, or a violent Contusion, are very difficult to be cured, and we are very frequently obliged to calm, or diminish these Symptoms, before we perform the Reduction, because they hinder the necessary Extensions.

It is therefore true, that many Things are against the Reduction of luxated Bones.

Briefly to recapitulate, three Things need only to be attended to; first, the Structure of the Joint; secondly, the Number and Texture of the Ligaments that embrace it; thirdly, the Force of the surrounding Muscles. By carefully examining these Articles, it is easy to discover wherein consists the greater, or less Difficulty we may meet with in reducing each Species of Luxation.

As to the Structure of the Joint, ginglymoid Articulations are, generally speaking, not so easily luxated, nor reduced with so little Pain, as those by Enarthrosis, as it is more easy to make a Bone slip into it's Cavity, when there is but one Head, than when there are several.

The Processes, surrounding some Joints, do more or less resist their luxating. The Foot is not easily dislocated lateral-

ly.

ly, particularly outwards, on Account of the Malleoli. It is not the same of the Wrist, though there be Processes at the Sides of the Ulna, and Radius. The Reason is evident; the Joint of the Foot is chiefly confined to Flexion and Extension, and forms a Ginglymus, whereas the Articulation of the Wrist with the Fore-Arm is a large Enarthrosis.

As to the Ligaments, the more numerous they are in a Joint, and the firmer and compacter their Texture is, the more difficult is it to be luxated, and the greater Force must be applied to reduce it. This is evident in the Joint of the Thigh, Knee, and Elbow, whose Ligaments are very firm and numerous.

It ought likewise to be remarked, that amongst the Bones, some are embraced much closer than others. The most close Joints are those of the Elbow, Thigh, and Knee.

As to the Muscles, the greater their Number is, and the stronger they are, as in the Thigh and Arm, the more difficult are their Luxations to be reduced, because they more powerfully resist the necessary Extension.

Lastly, we shall afterwards see, that there is a particular Prognostic to be made for each Species of Luxation.

Let us at present examine, what Means ought to be employed to remedy all these different Disorders of the Joints, beginning with the Cure of Luxations from an external Cause.

It consists in three Things: The first is to replace the Bone; the second is to secure it when reduced; and the third is to remedy the Symptoms, whether they accompany the Luxation, or succeed the Reduction.

Before the Reduction is undertaken, a Surgeon ought to attend to two Things; first, to the proper Time; secondly, to every Thing that should be prepared, and employed to effect it, and to keep the hurt Part reduced.

As to the Time, according to Hippocrates's Opinion in the Book of Articulation, Text LXIV, the Reduction of a Luxation ought to be attempted as soon as it has happened, and whilst the Limb is still warm, because then all the Muscles are supple; whereas, if the Reduction is delayed, the Muscles and Ligaments become so stiff, that the necessary Extensions cannot be made, without putting the Patient to very cruel Pains.

This Rule was very practicable in Hippocrates's Time, because in the Places where the public Games were celebrated, those who superintended them, perfectly well knew how to reduce the Bones; and thus, when a Wrestler happened, for Instance, to suffer a Dislocation, it could be reduced upon the Spot,

Spot, which cannot be done at present, where a considerable Time frequently elapses, before a Surgeon can be met with. Lastly, it is certain that a Dislocation is to be reduced without Loss of Time, unless there be some Contra-Indication. As, for Example, if the Humerus was fractured near it's superior Articulation, and dislocated at the same Time, it would be absolutely necessary to pass over the Luxation; because the necessary Extensions to reduce it, could not be performed.

When the Reduction has been delayed, or neglected, we must let the Symptoms, as Inflammation, Swelling, &c. cease; and before we attempt it, the Joint is to be prepared with emollient Fomentations, and oily anodyne Unctions, in order to render the Tendons supple, and flexible, and to benumb, as it were, the Joint; we are likewise to move it gently in all Directions, and at different Times. Secondly, the Surgeon should have all his Apparatus ready, and he should even have a Place like a Laboratory provided with several Posts, Benches, iron Rings, fixed, and so disposed, that he can put the Patients in Situations proper for all Kinds of Reductions, and fasten the Muffles, and other Machines properly thereto.

Three Things are necessary to reduce the Bone. The first is to draw the disordered Part towards the Body, or to hold back the Body, lest it should follow the hurt Part when extended; the technical Term is Counter-Extension. The second is to draw the Head of the luxated Bone downwards until it be disengaged, and brought opposite to, and even a little beyond it's Cavity; this is called Extension. The third is to guide this Head into it's Cavity, and this Motion is called Impulsion.

In order to the Performance of this Operation, the Body and luxated Limb must be drawn with the same Degree of Force, otherwise the weakest would yield to the strongest, and the Extension would be imperfect. Secondly, it is necessary that the drawing Powers be applied as near the luxated Parts as possible, otherwise they would be useless, and even hurtful. For Instance, if it is the Arm, it must be taken above the Elbow, and not below, because the Extension would only act upon the Joint of the Elbow. Thirdly, these Motions must be proportioned to the Distance of the Head of the Bone, and to the Power of the surrounding Muscles. Fourthly, we are to situate the Part so, that the Muscles may be in equal Tension, otherwise those that should be more strongly bound would too much resist the Extension, and might even lacerate. Fifthly, it is upon this Account that the Extension ought to be made gradually; but we can only conjecture at the proper Force, by comparing

paring the Course the Bone has been made to take, with the Distance judged necessary to carry the Head into it's Cavity.

The Extension being thought sufficient, the Bone is to be conducted into it's Cavity, either with the Hands, or with Machines, those that pull being ordered to slacken gently; but it is not to be pushed in, which would do no Good, but even much Harm, the Elasticity of the Muscles commonly replacing the Bone, as if it entered of itself. I own, nevertheless, that it is necessary to assist, and direct the Action of the Muscles. Sometimes the Head gets in as it were of itself, and at other Times with some Difficulty, either on Account of the Viscosities filling up the Cavity, out of which it is slipt, or because the Brim of the Cavity is fractured, or forced inwards.

To answer the two last Indications, it is necessary in extending the Part, to bring it back by the same Way it took in luxating.

Nevertheless in some Luxations we are obliged to move the Part in a contrary Direction to that, which produced it, and this is only done to disengage the Head of the Bone from the Cavity, where it might be wedged in. For Example, if the Process at the superior and internal Part of the Ulna was engaged in the Cavity, where the Olecranon is lodged, it could not be withdrawn without bending the Arm, and even without making Use of Wedges proper to separate these two Bones, as is done when the Arm is bent round a Bed-Post, or when some other solid Substance is put in it's Bend.

It is seen from thence, that though the Reduction of each Species of Luxation seems to require a particular Method; nevertheless the general Rule is to bring back the Bone by the same Way it took in Luxating.

We have said, that it is necessary to dispose the Parts so that the Muscles may be equally extended; for Instance, if the Head of the Humerus is fallen under the Axilla, in order to make the Extension, the Arm must be placed at a right Angle with the Body, that the deltoid Muscle which is the most in Tension may be managed.

When an old Luxation is to be reduced, the same Method must be pursued as if it was recent; but if the Muscles have recovered their Spring, and the luxated Part has begun to move with sufficient Freedom, then the Operation is as difficult as if we tried to dislocate a sound Part, and frequently all our Endeavours are useless, and serve only to increase the Disease. To which it is necessary to add, that the Ligaments have acquired such a Disposition that they only require, as it were, to remain in that forced State, into which the Luxation has reduced.

192 OF LUXATIONS IN GENERAL.

reduced them. The Reduction of a luxated Thigh must never then be attempted; for Instance, when it's Motion is sufficiently free, and the Patient had better limp all his Life, than be exposed to cruel Pains to no Purpose. A Surgeon in that Case ought not to undertake the Reduction of old Luxations, except when the Patient suffers the same Accidents, and Pains, as at the Instant of the Luxation. Then as they are obliged to implore his Assistance, he ought to use all his Industry to reduce the Dislocation.

In order to extend the luxated Part, he uses his Hands, or those of Assistants, with, or without Ligatures; without, as to the Jaw, where they cannot be made Use of; and to Children, where the Hands suffice.

The Ligatures are supple, and soft, as Straps of Leather, or Lists of Cloth, or Ribands, &c. The first are the best. The Part is surrounded with these Ligatures, both Ends are left hanging down in order to be pulled. There are two Sorts of Ligatures in Use, viz. the Ligature with a Loop, and that without, the one draws equally on both Sides, and the other on one only. This last is intended for incompleat Luxations; but as it is always necessary to draw equally, and in a straight Line, as well in the incompleat, as compleat; the Ligature without a Loop must always be used, and Care taken to apply it upon a firm Part. For Example, in the Luxation of the Arm, the Knots of the Ligature making the Extension must press above each Condyle; and as every Ligature is with Slip-Knots, the Part it should surround must be provided with a Compress, lest it should hurt it.

If the Operation sometimes fails in fat Subjects, it should not be attributed to the Resistance of the Muscles, but to the Quantity of Fat under the Skin, because the Cells that compose the Fat being compressed, are closed, whereby the Ligature sinks in, and loosens, and does not draw. This Ligature embraces a Kind of moving Sand, which flies in Proportion, as it is pressed. In such a Case it must be tightened.

It very frequently happens that, either by Reason of the Force of the Muscles of the dislocated Part, or on Account of an old Luxation, the Hands alone are not strong enough to make the necessary Extension. In that Case, without obstinately persisting, and tormenting the Patient to no Purpose, Recourse must be had to Machines, such as Hippocrates's Ambe and Bench, Muffles, and some others of this Nature; and that must be chosen which is proper for every Luxation, as will be shown when we come to speak of the operative Part. Amongst the Instruments that may be made Use of in making the necessary

fary Extensions, the Muffle mounted upon the Machine invented by the late Mr. Michaut, Surgeon, is the most proper. He used it with great Dexterity, and Success.

That Machine has this Advantage, that it makes the Extension and Counter Extension at the same Time by one same Muffle, and Lever, and it keeps the Body, and Cavity of the Box firm and immoveable, at the same Time that the luxated Bone is drawn from the Place it was lodged in, to be conducted in a straight Line into it's natural Place by Means of a Kind of Compass, in Form of a Crescent, wedged in upon the End of the Lever where the Muffle is fixt.

The Body is kept firm by some Bars, which inclose it as if it was fixt in a Vice.

The Ligatures, and Machines, sometimes occasion very terrible Accidents; for Instance Ecchymoses, Excoriations, Contusions; which, being joined, with those of the Luxation cause acute Pain, or Numbness, a Paralysis of the Limb, Abscesses, and very frequently the Disorder is greater, at the Place where the Ligature serving to make the Extension has been applied, than at the reduced Joint. Which is the Reason why Resolvents, and other proper Remedies must be applied thereto.

The Part is known to be reduced, first, by a dull Noise that has been heard, when the Bone has entered into it's Cavity; secondly, by the Change of Figure in the Part, so that by comparing it with the sound one, it is of the same Length, and precisely of the same Shape; thirdly, by the Freedom where-with the Patient makes Use of it. Very frequently after the Reduction of the Luxation, he cannot move the Part, because he feels too much Pain in consequence of the Contusion, and Laceration of the Parts surrounding the Joint; but the Surgeon can nevertheless move it in all Directions.

The Noise the Bone makes in entering, is not always a certain Sign of a good Reduction, and it is always much more proper to judge of it by the good Conformation of the Part, and by the Freedom which it ought to have in performing all its Functions, when it is well reduced.

The Parts being thus replaced, are to be kept so as well by Bandages, as by a proper Situation; and thus the second Indication is answered.

Bandages cannot be dispensed with in Luxations from an internal Cause; because, the Ligaments having been relaxed, the Bandages must supply this Defect, until they have recovered their natural Tone: Secondly, in old Luxations, from an external Cause, and that for the same Reason, especially

when they are accompanied with Paralysis : Thirdly, in the Luxation of the Rotula, because it is easily displaced, by the Motions of the Leg ; in the Luxation of the Clavicle, on Account of the Motion of the Shoulder and Weight of the Arm. I shall, when I speak of each in particular, make some Remarks, which will show that these Species of Luxations are not so frequent as Authors have imagined : Fourthly, in the Luxations of the Wrist and Foot, or of the Fore-Arm, or Leg, because they are commonly accompanied with some Separation of the Bones. There are some Reflections to be made upon this Subject, which shall come in their Turn ; Fifthly, in the Luxation of the Jaw, a Bridle, or Sling with four Heads is made Use of, especially when it is owing to Gaping, because in this Case the Ligaments are naturally weakened, therefore they want supporting.

In the other Luxations, the Bandage is less necessary, and it ought not to be so tight, as it very frequently serves only to keep on the Compresses, and Medicaments.

As for the Situation proper for Luxations, it respects either the Body, or the dislocated Part.

As to the Body, the Patient must lie in Bed in all Luxations of the Trunk, and inferior Extremities ; but it is not necessary in those of the superior Extremities, and Jaw. In Respect to the Situation of the Part, it must be such that it's surrounding Muscles be in a just Equilibrio, and that the Blood, and Lymph may freely return to the Heart ; therefore in Dislocations of the superior Extremities, the Arm, and Elbow must be a little bent, and, as they are drawn downwards by their own Weight, they are to be supported with the Sling. This Rule may be applied to others.

If a Bandage is made Use of, the same Care is necessary in applying it as in Fractures, lest that by binding it too hard, it may produce the above mentioned Accidents.

In order to answer the third and last Indication, the present Accidents must be remedied, and those that threaten it prevented.

The first are the Pain, and Difficulty of moving the injured Part, the Swelling, Inflammation, Fever, &c.

The quickest Remedy for the Pain is the Removal of it's Cause, that is, to reduce the Bone well, and should it continue after this Operation, it is a Proof that the nervous and tendinous Parts have been lacerated, or injured. Then Recourse must be had to repeated Bleedings, a very exact Regimen, the Body must be kept open by Clysters, and tempered Diaphoretics mixed with Anodynes must be made Use of.

As

As to Topics, emollient and anodyne Fomentations are used.

The Inflammation and Swelling, which so frequently accompany the Luxation, ought to be treated with the same Remedies as those already proposed in speaking of compound Fractures. I say the same of the Convulsions, which frequently attack the dislocated Part, by Reason of the Dragging; which the tendinous Parts have undergone.

But amongst the Accidents accompanying Luxations, those are the most terrible that Hippocrates mentions in the Book of Joints, Text XVI, & XXXV.

In the first he says, that as often as a Wound is joined with the Luxation where the dislocated Bones shall be bare, their Reduction must not be undertaken; particularly if in Joints whose Motions are of great Importance, as those of the Arm, Elbow, Thigh, Knee, &c. are, for if their Reduction is attempted, it will occasion very terrible Accidents, which will soon destroy the Patient. On the contrary, if that happens to the Joints of the Hands, and Feet, nothing better can be done than as quick a Reduction as possible. In such a Case, I believe it would be best to situate the wounded Part so as to be the most supportable to the Patient, and to treat the Wound like that of the Joints. The Bandage should only be contentive, and the Rest must be left entirely to Nature, and we are to wait for the Exfoliation of the Bone, which will be more or less deep, according as it shall have been more or less preserved from the Effect of the Air, and Putrefaction of the purulent Matter.

Secondly, Hippocrates in the XXXVth Text of the same Book of Joints, observes that, when a large Wound is joined with the Luxation, and the Bones have started out through the Wound, the luxated Bones must not be replaced, upon Account of the Convulsions, and Gangrene, occasioned by these Reductions, which soon kill the Patient, whereas if the Reduction is not performed, the Patients generally live. It is true the dislocated Part remains impotent and incapable of Action, but the Condition of the Patient is always better; for, Life with those Inconveniencies is preferable to certain Death; now the Reduction is so much the more dangerous in these Circumstances, as the Joints serve to more important Functions. But if it happens to the Joints of the Fingers, &c. the Reduction must be performed as soon as possible.

Hippocrates tells us in the same Place, that there is no Danger in cutting off the Portion of the Bone appearing through

the Wound, and that it must be dressed like that of the Joints, by situating the Part properly.

This Opinion of Hippocrates requires some Explanation. It is not exactly true that those Patients do escape, when the Luxations are not reduced; for we know by Experience, that the greatest Part die languishing, and that in that Case no other Prognostic but that of Death can be made, unless as already mentioned, those Wounds happen only to the Joints of the Hands, where they can be reduced, and easily cured.

In a like unfortunate Circumstance, I believe the following Rule might be kept to.

If the Wound through which the luxated Bone passes out is accompanied with no very pressing Symptoms, the Part of the Bone out of the Wound, according to Hippocrates's Advice, must be cut off, and treated like that of the Joint; but, if the Symptoms are very pressing, the Amputations must be immediately performed.

There is still another very terrible Accident, that attends Luxations; which is the Extravasation of the Synovia, that trickles down from the sprained Tendons, the contused and elongated Ligaments; and it is chiefly on this Account, that the Bellies of the Muscles, and their Tendons swell, and harden; but this Accident is not to be feared, except in Dislocations badly reduced; for, when the Bone is in it's Cavity, the Ligaments strengthen, the Apertures through which this Liquor flowed, close, and the Motion of the Joint diffuses it equally on all Sides.

When the luxated Bone is likewise fractured, we are to endeavour to reduce the Luxation before the Fracture; but if that cannot be effected, which is the Case of a Fracture near the Joint, because there is no Hold to make the Extension, then the Means proposed in treating of compound Fractures ought to be pursued.

The Accidents that succeed the Reduction, are bad Abscesses, and a Gangrene, which are occasioned either by the violent Contusions, and Laceration of the Part during the Reduction, or by too tight Bandages. They are remedied by the same Means that have been proposed in speaking of compound Fractures.

Lastly, the Anchylosis is an Accident, which very frequently supervenes after the Reduction, when the Part is kept too long in the same Situation, without being moved. But as it is a very frequent Disease, I will treat of it *ex Professo*; nevertheless it is proper to clear the Surgeon from the Charge
of

of the Ankylosis, which is the Consequence of the Part's having been kept too long in the same Situation, he having only pursued this Method in order to avoid more terrible Accidents.

I will finish this Chapter with two Observations selected from amongst many others, which contradict what Hippocrates has advanced. Indeed Practice has afforded us many Examples of Luxations of the principal Joints, where the Bones have been laid bare with Fracture, and Discharge of the Synovia, where the Patients have been cured. I will only speak of two Patients of this Kind, whom I have treated.

OBSERVATION I.

A Certain Person, about twenty Years of Age, had his Humerus fractured, two Fingers Breadth from it's Articulation with the Fore-Arm. The upper Portion passed out above a Finger's Breadth through the Teguments. The Olecranon had quitted it's Cavity by the Rupture of the Ligaments, and the Radius was separated from the Ulna. The Teguments were dilated, the Pieces were replaced, as well as they could be; there was no Exfoliation, but a Crowd of Symptoms ensued, which were not dispersed but by Means of several Abscesses, that formed at the Joint. The Patient got over it by having the Joint ankylosed.

OBSERVATION II.

A Carrier had the external Condyle of the Femur entirely separated lengthwise by a Cart-Wheel, with a Wound, and Rupture of the Ligaments, and several Tendons, which occasioned very terrible Symptoms, and Abscesses. This Patient was nevertheless cured, like the former, by Bleedings, Diet, Remedies proper to prevent a Gangrene, a good Situation, and without moving the diseased Parts, the eighteen-tailed Bandage being made Use of.

CHAP. II.

Of the Contortion of the Head of the Bones, and that of the Muscles.

IT sometimes happens, that the Arm, for Instance, having been moved in different Directions by extraordinary Efforts, is entirely deprived of Motion, because the natural Si-
tuation

tuation of the Bone and Muscles has been changed, the Head of the Bone having been turned round in it's Cavity, and the Muscles of the Arm so distorted, that they have remained in a very forced Situation. All these Disorders deprive the Arm of Motion, and the Patient must be lamed thereby, unless we quickly disengage the Bone and Muscles from the Constraint they are in. It is evident that this Disorder of the Joints can only be classed amongst incompleat Luxations, because the Head of the Bone, though displaced, has not entirely quitted it's Cavity.

The whole Cure consists in replacing the Head of the Bone that is turned, which must be effected by forcing it to move in different Directions, especially in a contrary one, and it ought not to be then left, but must, on the contrary, be kept in it's Place by a Bandage, as if it had undergone an incompleat Luxation.

C H A P. III.

Of Club Feet.

IT sometimes happens, that certain Joints are turned inwards, or outwards. This bad Configuration is owing to a Fault of Nature, or Disease. There are some, for Instance, whose tarsal, and metatarsal Bones, are so formed, that the Foot appears round, or of some other Figure, and these Faults of Conformation are incurable; sometimes this bad Configuration proceeds from Luxations of the Bones of the Foot, or from the Displacing of the tarsal Bones, and these Disorders are very frequently incurable, especially when they are ancient; there are some, lastly, that only become so through the bad Treatment of ignorant People.

Children are sometimes born with the Feet thus turned, which is owing to the bad Situation they have been forced to keep in the Uterus; but it is more frequently produced by the Fault of the Midwife, who, in a difficult Labour, handling the Infant's Limbs too roughly, changes, and spoils it's Figure. This Accident likewise frequently happens, through the Fault of Nurses, either by swaddling the Children badly, or by pressing their Knees and Feet too rudely in carrying them, or else by leaving them too long in a bad Situation.

Those whose Feet are turned inwards, are called *vari*; and those who have them turned in a contrary Direction, are called *valgi*; both are commonly called *Club-Feet*. These

bad Configurations do not happen to the Feet alone, but likewise to the Knees, Elbows, &c. Concerning which it is necessary to remark, that the Foot is most generally turned outwards, and the Knee inwards.

These Contortions depend solely upon the unequal Tension of the Muscles and Ligaments; for those that are in extreme Tension drawn on their Side, whilst the others yield by their Relaxation.

As these poor Children try to ease themselves, they commonly turn the Feet on the Side, where the Muscles and Ligaments are the most extended, viz. on the Side opposite to the Distortion, and this is what keeps the Feet in this bad Figure.

The whole Cure consists in the Use of Machines that may fix and keep the Feet in their natural Form, by bringing them gradually into it. Such are half Boots, and other similar Instruments.

CHAP. IV.

Of the Relaxation of the Joints.

WHEN the Force of the Ligaments that support the Joint is weakened, then the Head of the Bone gradually quits it's Cavity by it's own Weight, because it is no longer duly embraced, nor compressed, and according to it's greater or less Distance from it, it makes a compleat or incomplete Luxation.

In order to the proper Treatment of this Disease, the different Alterations of the Ligaments, and Synovia of the Joint must necessarily be attended to. That of the Ligaments consists either in their Relaxation occasioned by superfluous Humors, rendering them supple and lax, as happens to those who live, or lie in moist and marshy Places; or in their mere Weakness owing to a Want of nutritive Juices, as in long Diseases, and Paralyfes, and then the Head of the Bone gradually quits it's Cavity by it's own Weight, because it is not sufficiently supported. In other Cases, it is forced out either because the Ligaments swelling fill up the Cavities of the Joint, and force out the contained Head, as is observable in certain Swellings of the Ligaments of the Thigh or Knee; or else it is compell'd to leave it by the Synovia of the Joint, which changing into a Kind of Plaister, gradually pushes out the Head of the Bone,

by overcoming the Spring of the Ligaments that embrace it. This Sort of Disorders are very difficult to be cured, and obstinately resist Remedies.

As the most frequent Alteration of the Ligaments is their Relaxation, occasioned by too great a Quantity of Lymph, we are carefully to examine how it may be remedied.

If the displaced Head of the Bone is owing to a simple Relaxation, the most proper Means are first Hydragogues, which are frequently used, such are Gutt. Gamb. Spin. Cervin. Jalap. Scammon. Troch. Alhandal. hiera Picra. Diaphoretic Ptisans are also usefully employed, for Instance, with Sassafras, Sarsaparil. Rad. Chinee, joining therewith Bardan, Carduus benedict. Acrid Diuretics extracted from Sal. Ammoniac. Urin. Nitr. Milliped. are likewise used, &c.

During the Use of these Remedies, externally is applied every Thing that can warm, dry, and absorb; very thick Compresses wet in Aq. hung. or in Sp. Vin. sharpened with Sal. Ammon. and Camphor, are applied upon the Joint. Liniments made with Ol. Lavend. Axung. Mugil, or with Sp. Vin. Ol. Cerae distil. Ol. Succin. or Ol. Terebinth. and Sap. Genoen. are applied hot. These Oils open the Passages, and are extremely penetrating and resolvent.

If those Remedies are inefficacious, Recourses is had to those called irritating and caustic. Such are the following Plants: Chilidonium, Persicaria, Pyrethrum, Euphorbium, Sinapi. &c. in order to draw, as it were, a Fluxion on the Part affected, and to diffuse the Matter, and bring it to the Surface of the Joint, and procure the Means of digesting it, and making it transpire; and it is, for the same Reason, that Cauteries and Stoves are so useful. Fumigations with Mastic and Succin. are esteemed. Emplast. Styptic. Crollii dissolved with Ol. Tartar, or Ol. Laterum, is usefully employed. We are sometimes to endeavour to open the Skin, by sweating the Patient, External and Internals being made use of at the same Time. For Example, a good Sudorific is ordered to be taken, and whilst all the Fluids are in Motion, the half of a Loaf of Bread just taken out of the Oven, and wet in good Sp. Vin. is applied to the Joint, in order to draw the Humor fixed at it's Bottom, to the Surface, and make it transpire. Vesicatories are also successfully employed; but nothing is more efficacious than the Use of Baths, and Sediment of warm mineral Waters.

If a Paralysis is joined with a Relaxation of the Ligaments, internally are taken Preparations extracted from Castor, Succin. Junip. Nitr.; volatile oily Salt, that of Vipers, and such like;

like ; cephalic Waters, for Instance, that of Meliss. com. is employed. Externally are applied Fomentations with aromatic Wine, and Unctions of Ol. Petr. Ol. Peruvian. Bracc. Junip. Ol. Lavend.—Salviæ—Lauri—Romin. distil. Ol. Formicor.—Lumbricor. sharpened with Sp. Sal. Ammoniac.

Let us at present examine how the luxated Bone occasioned by a Swelling of the Ligaments is to be treated.

It is commonly owing to some Collection of Matter, or a Fluxion upon the Joint ; with Pain, Inflammation, and other Accidents. In such a Case, the necessary Revulsions must be quickly made by general Remedies, especially by Bleeding, Ptisans, and a proper Regimen. In Regard to Topics, because the Pain is urgent, emollient, and anodyne Cataplasms are applied, Recourse not being to be had to Resolvents, till the Pain is assuaged. Ol. Lumbricor. is very usefully employed. But, in order to make a powerful Revulsion, Cauteries, and Vesicatories must be joined to all those Remedies.

If the Head of the Bone is dislocated by the Inspissation, and Coagulation of the Synovia, the Remedies must be employed, which I shall propose in speaking of the Cure of Ankyloses, owing to Viscosities.

CHAP. V.

Of the Sprain and Separation of the Bones.

ARTICLE I.

Of the Sprain.

WHEN the Head of a Bone by any violent Motion, that has overcome the Ligaments surrounding the Joint, has been near quitting it, that Disease is called a Sprain.

When Sprains happen to a Joint composed of several Bones, as the Foot, the inferior Extremities of the Fibula, and Tibia, may be separated from each other by the powerful Shock upon the Joint, and then two Diseases are produced, to wit, Sprain and Diaffasis.

The Sprain of a Joint is known by the Pain, and Swelling produced in Consequence of the Contusion of the Tendons, and Ligaments that surround it. This Joint may perform all it's Motions well upon the Spot, but it is afterwards totally deprived of them by the supervening Accidents.

If

If the Surgeon attends to these Accidents, and considers that the injured Part always keeps it's natural Figure, he will easily distinguish the Sprain from the Diastasis, or Separation. He ought likewise to pay Attention to what passed during the Fall, or any other Shock. Let us suppose, for Instance, that the Foot is entirely turned towards the external Malleolus, and that it is instantly replaced, which cannot be supposed to happen, unless the Fibula has been somewhat separated. Nevertheless, it is difficult to discover it; because all the Parts composing the Joint of the Foot appear in their natural Situation and Form, and the Swelling visible, there is only a Consequence of the Sprain. It is nevertheless true, that sometimes we observe the Malleoli somewhat separated.

It is easily known what renders those Disorders so terrible, and slow in curing, if all the Diseases are attended to, to which the hurt Part is exposed from the external Cause, the Patient, and the Surgeon.

Those proceeding from the external Cause are the Sprain, and Contusion of the Ligaments, and Tendons of the Joint, and the Extravasation of the Synovia that lubricate them; from whence necessarily ensues the Swelling, and Hardness of the Joint, the Pain, and Inability to move it.

The Disorders from the Patient are owing to his fatiguing the injured Joint, by endeavouring to use it, and despising, and neglecting the Advice of the Surgeon. Then the above-mentioned Symptoms increase; the tendinous and nervous Parts of the injured Joint are compressed, and sprained afresh by the different Motions of the Part, and thereby a Disease, that might have been cured in five or six Weeks, continues five or six Months, and very frequently a whole Year.

The Disorders occasioned by the Surgeon proceed from his having employed Remedies too hot and drying at the Beginning of the Disease, which by irritating all the nervous Parts of the Joint, have drawn so great an Inflammation, and acute Pain there, as threaten a Train of other Symptoms.

In order to cure this Disease with Certainty, we are solely to apply to the Prevention of the Accidents. In this View, if the Surgeon is called at the Instant of the Fall, he may boldly apply some Repellent upon the Part. For Instance, he makes a Mixture of Alum, Chimney Soot, and the White of an Egg, or the Part may be plunged into a Pail of Spring Water. This Sort of Medicines prevent the Inflammation, by hindering the Extravasation of the Juices, and close, as it were, the little Mouths of the Vessels that have been opened, or dilated.

But this Assistance is very frequently inefficacious, or it comes

too late. Then necessary Revulsions must be immediately made, particularly by Bleedings, a proper Diet, and by keeping the Body open. As for Topics, the Part is fomented with warm Water, then it is embrocated with Oil and Water mixed together; and as the Patient feels no Pain at first, it must be bound up with the same Care as if it was fractured, and the Bandage is not to be removed, unless the Accidents oblige to it, or it be too loose. Care is taken to moisten the Dressings Night and Morning with resolvent and anodyne Fomentations.

Though the Inflammation seems to diminish, which happens towards the seventh, or eighth Day, we still keep to the most simple Resolvents, as warm Wine, or Brandy; and we use a Fomentation proper to strengthen the Ligaments and Tendons, and resolve the Viscosities. It is composed of Fol. Sambuc.—Absinth. Ros. rubr. Bacc. Junip, the whole boiled in Wine. When we see, that there is nothing to be feared from the Resolvents, we sharpen them with Sp. Vin. camphor. or Ol. Romanin, or Ol. Lavend. &c.

Lastly, towards the End, the Spring of the nervous Parts is strengthened by Ol. Lumbricor. or Vin. Aromatic. or by the Use of Baths, and the Sediment of warm mineral Waters; and Care must be taken to leave the Part bound up until the Swelling be entirely dispersed, and the Joint free from Pain; for, let it suffer ever so little, all the Symptoms may be renewed, as soon as the Patient shall attempt to walk.

When a Patient feels no Pain at the disordered Part, and is sure his Foot is not dislocated, and can move it in every Direction, it is very difficult to persuade him to make Use of so many Remedies, and keep himself so very still. Then the Surgeon ought to make his Prognostic, by informing him that his Disorder will become worse and worse, and that he runs the Risque of becoming a Cripple. Indeed, if he trifles, it happens, that, though he feels no Pain for the first Days, the extravasated Synovia and Lymph become acrid by their Stay, and ferment, the Inflammation increases, the Ligaments, Tendons, and their Sheaths swell, the Viscosities multiply, and the Joint becomes extremely swelled, and so painful, that the Patient cannot move it ever so little without piercing Cries. Then however reluctant to Medicines, he is obliged to have Recourse to them. But, as it is much easier to prevent the Symptoms than remedy them when produced, a Patient, who might have been cured in a short Time, is obliged to pass whole Years in Bed, or in his Chamber; and what is more terrible for him, is, that after having suffered much he may remain lame, because the Viscosities increasing within the Joint,

Joint, and betwixt the tarsal Bones, are like so many little Wedges, that force them out, and half luxate them, whereby the whole Joint swells. Then, if they harden, it ankyloses; and if they alter, and change into Pus, they occasion abscesses very difficult to be treated, the Matter of which becoming very acrid erodes the Tendons, and renders the Bones carious; and this Ulcer cannot be cured radically, but by laying bare as much as is necessary, in order to exfoliate all the ulcerated Part.

ARTICLE II.

Of the Diastasis, or Separation of the Bones.

THE Separation of the Bones is most frequently owing to a false Step. For Instance, the whole Shock the Astragalus suffers is communicated against the End of the Fibula, which is called the external Malleolus, and this Shock is sometimes so violent, as to separate the Fibula from the Tibia. This the Greeks call Diastasis. When the Wrist has been exposed to any violent Shock, the Extremities of the Ulna and Radius do not suffer the same Separation, nor the same Accident; but it very frequently happens, that a forced Extension, or a Relaxation of the Ligaments, occasioned by a Fall, is taken for a Separation of these two Bones. The Effect of this Shock ought rather to be called an incompleat Luxation. The Radius and Ulna cannot be separated except in some extraordinary Cases.

When the Diastasis is joined with the Sprain, it is much more terrible, and slower in the Cure; and the best Practitioners are of Opinion, that this Sort of Diseases are not near so easily cured, as a true Luxation, but it is a hard Matter to distinguish between them, and very frequently the Remedy is not applied until the Symptoms are arrived to such a State, that it is very difficult to stop their Progress. It is not the same in Regard to Luxations, since they are easily known by the Sight or Touch, and they may be remedied at a favourable Opportunity. It is necessary to add, that these Separations generally happen only to the most close ginglymoid Joints.

Though this Separation seems slight, yet it afterwards occasions very terrible Accidents, and often deceives the Surgeon, because he imagines all the Accidents of the injured Part to proceed from the Sprain, although they be owing to the Separation, which he was not able to discover. What I say respects in general all Practitioners. It is the Opinion of the most famous, that those Diseases are very difficult to be cured.

The

The Symptoms owing to the Separation of the articulated Pieces are nearly similar to those of the Sprain; for in this displacing the Sheath of each Tendon is disordered and elongated, and the Tendon compressed; whereby the Synovia both of the Joint and Tendons is extravasated, and inspissates, or putrifies; thus it causes a viscous or purulent Ankylosis.

In order to remedy those bad Accidents, it is necessary first to examine whether the separated Pieces of the Joint are replaced of themselves. If they are, they must be kept so by a common Bandage, care being taken not to compress too much; if they are not so replaced, they must be brought back into their Place by proper Extensions, and kept there as well by a proper Situation of the Part, as by the Application of a Bandage. The Compress, that should embrace the injured Part, must be wet in a Defensive, as the White of an Egg beat up with Ol. Rosar. The Bands and Compresses that should be employed, are to be dipt in warm Water. At the other Dressings the same Circumstances must be exactly observed, as in the Cure of the Sprain, and Care should be had to make the same Revulsions by Bleedings, Clysters, and Diet.

As for the Disorder, or rather the Shock the Astragalus may suffer on some Occasions, it ought not to be ranked amongst Luxations, though the Articulation of this Bone with the Scaphoid ought to be considered as a small Enarthrosis. The Foot cannot be pressed upon the Ground, nor moved, without moving the Head of the Astragalus somewhat in the Cavity of the Scaphoid, either inwards or outwards, or from upwards downwards, or from downwards upwards, which depends upon the Position of the Foot and the Ground we walk upon. Although this Motion be not sensible, that of the Foot with the Leg in walking, could not be executed so freely without it; nevertheless, it is nothing strange, that when the Foot is forced to some Distance from it's Articulation, the Scaphoid suffers a greater or less Extension; from whence proceeds Pain, Tension, Swelling. Now these Symptoms are communicated to the Cuboid, Calcaneum, and other Bones, by it's close Union with them, and the many Ligaments, that are in those Places cannot stretch, nor yield, as those do, whose Articulations are free.

It is to be remarked, that the Cavity made by the Junction of the Calcaneum, and Astragalus, is filled with Fat and Glands. The Obstruction that happens to this Part occasions that, the Patient in moving his Foot, feels excessive Pains, and an oedematous Tumor is evident to the Touch. The Foot is generally inclined to that Side where the Muscles have been

been extended; that is, to the Side opposite to the Displacement; this is what makes the Patient endeavour to keep the Foot in this bad Situation, to save himself from the Pain in these Circumstances.

The Remedies used in Sprains, are proper here. In some Cases the Foot swells so much, that the whole Articulation suffers; insomuch that it is very difficult to know certainly what Part has been hurt in the Fall. Finally, the Separation of the tarsal Bones is not always succeeded by the before-described Accidents. For I have seen a young Man, eighteen or twenty Years of Age, who was a great Dancer, whose Scaphoid of each Foot projected out of the *Ossa cuneiformia*; and *Astragalus* more than a Finger's Breadth, without any Inconvenience being felt from it.

CHAP. VI.

Of Luxations in particular.

ARTICLE I.

Of Luxations happening to the Head and Trunk.

I. Of the Luxation of the Lower Jaw.

IN order to shew how the lower Jaw is luxated, we will carefully describe it's Structure, and the Parts that move it. We will first examine the bony Parts, as they are in the Skeleton; the Articulations provided with the intermediate Cartilages, and Capsulæ surrounding each Condyle; and, thirdly, the Muscles serving to move the Bone, and the neighbouring ones of these Joints. To treat of these three Heads:

The first merely respects to the Structure of the lower Jaw.

It is considered in the Adult as composed of one Piece. It is narrow at it's anterior Part, which is called the Chin; more or less curved, especially in some, but chiefly in old People. It is widened at it's Sides, tending from forwards backwards, where it is separated into two Branches which rise, one to the right, and the other to the left. Each of these Branches is divided into two. This Division leaves a Space in Form of a Notch. The anterior one is called the Coronoid Process. It gives Attachment, or Insertion to the Tendon of the temporal, or crotaphite Muscle. When the lower Jaw is closed, it is lodged under the zygomatic Process, tending more forwards, than backwards.

The

The posterior Branch is called condyle. There is one on each Side. Their Figures and Situations are very different from other Eminences so called. For Example, the Condyles of the Os Occipitis tend from behind forwards. They are received in the Cavities of the superior oblique Processes of the first Vertebra of the Neck, and are confined by their Articulations to Flexion and Extension. The Condyles of the Femur are very large, and proportioned to it's Size. The internal is more stretched out than the external. They tend from forwards backwards, and are received in the Cavities of the Tibia. Their Motions of Flexion and Extension are very sensible, and in the Skeleton they may be easily moved on the Sides.

As for the Structure of the Condyles of the lower Jaw, their Figure is a little oblong. They are curved from behind forwards. They are placed transversely. They are convex posteriorly, and concave anteriorly, in order to give Attachment to the external Pterygoid Muscles. At the Center of each Condyle is a transverse Line that separates each into two Surfaces, the posterior appears to be the larger.

These Condyles are at a great Distance from each other on Account of the Space between the Branches. It was necessary that this should be so. because Nature has there placed the Tongue, which is the Organ of Taste, a large Bag, called Pharynx, serving to Deglutition; the Larynx designed for the Admission, and Emission of the Air, and to form the Organ of the Voice, &c.

At each Side of the Roots of the Zygomatic Processes is seen an oblong transverse Cavity hollowed in each temporal Bone, whose Center is depressed. The anterior Part of this Cavity is bounded by a transversal Brim, above which is a little flat Surface, it's posterior Surface is bounded by the anterior Surface of the bony Canal of the Ear, which is a little depressed, and by a little Apophysis, that serves to sustain the Root of the Styloid Process. This Surface is more or less raised at it's Extremity. It is smooth, which is owing to the Motions of the Condyles upon those Parts.

The Glenoid Cavities of the temporal Bones bear perpendicularly upon the Condyles.

The Structure I have given both of the Parts of the lower Jaw and glenoid Cavities of the temporal Bones, respecting the Articulation of these Pieces in the Skeleton, shows that the Motions of the Jaw are free. It may be moved on all Sides, For Instance, when it is depressed, it is considerably removed from the superior, it is easily moved towards the superior, and from the right to the left, and from the left to the right, Mo-
tions

tions that have been considered as a Species of Rotation. The two first Motions are a Ginglymus of the second Species, which nevertheless varies from other Articulations of this Kind. This proves likewise, that the Jaw no-ways partakes of the Articulation by Enarthrosis; for if it did, the Center of each Condyle would necessarily turn upon it's Axis in the Middle of each glenoid Cavity.

The second Head we have proposed to examine. is to consider the Condyles articulated, and stript of all their Muscles.

Each Condyle, and glenoid Cavity of the temporal Bone is incrusted with a Cartilage. Between which is an intermediate one, so placed as to be concave at it's Center. It entirely surrounds the Condyle. It's whole Circumference is closely united to the Capsula that surrounds the Joint, and is attached round the glenoid Cavity. As the lower Jaw moves in the glenoid Cavity, the intermediate Cartilage follows the Motions of each Condyle, which it invests, since it is of the same Figure. The Looseness of the Capsula nevertheless contributes greatly thereto. We observe likewise, that the transverse Brim at the Fore-Part of the glenoid Cavity makes, as it were, a Slope which permits the intermediate Cartilage to pass easily over, and move on the little flat Surface which is forwards; it is this that allows the lower Jaw to be removed easily from the superior.

The third Head we have to examine concerns the Motions of the lower Jaw, depending upon the Action of the Muscles. The strongest are the Levators; as the Crotaphites, Masseters, and internal Pterygoids.

The Crotaphites occupy what is properly called the Temples. Without speaking of their different Attachments, it will be sufficient to give only a simple Description of the Plans of Fibres composing each.

The Direction of these Fibres is of three Sorts; there are two lateral Portions, and a middle one. The lateral Portion attached towards the Mastoid Process tends obliquely from behind forwards, and terminates by tendinous Fibres, lying in the same Direction. They are lodged under the Beginning of the Zygomatic Process. The Fibres of the opposite lateral Portion are nearly the same. They do not become tendinous, till they pass under the Arch of the Zygomatic Process at the Side of the little Angle. Lastly, the Fibres of the third Portion, which is in the Middle, are perpendicular. These Fibres are longer than the above mentioned, and become tendinous sooner. We also observe some Plans of Fibres going off from the inferior Part of the Zygomatic Process. The Union

of these different Kinds of Fibres make but one Tendon, that embraces the coronoid Process, which is lodged under the Zygomatic.

The Temporal Muscles are very strong, and are assisted by other four, two of which are placed at the external, and the other two at the internal Part of the Jaw. The external occupy the posterior lateral Portion of the Jaw. Their Direction is a little oblique forwards. The Parotids lodge in the Space between them and the anterior Part of the Ear.

The Masseter Muscle is very tendinous, chiefly at it's anterior Part. There is a Plan of Fibres of this Muscle, which by it's anterior Part is attached to the Side of the Root of the Zygomatic Process, whose opposite Extremity occupies the Place, where the before mentioned rising Process is divided into two Branches, and there it terminates.

The other two Muscles are the internal Pterygoids. There is one on each Side. They are placed internally, and as it were, upon the same Line in which the Masseters are externally; nevertheless their Directions are a little different. If one of these Muscles is considered separately, it is obvious that one of it's Attachments is in the whole Pterygoid Fossa to the internal Ala, as far as the little Hook that terminates this bony Plate. The Body of this Muscle descends obliquely from forwards backwards, to be inserted internally by it's other Extremity to the Inequalities of the Angle of the Jaw.

The proper Use of these three Muscles in their Contractions is only to raise the Jaw, in order that the Teeth may act with greater or less Force upon the Aliments, and keep the Condyles in the glenoid Cavities. When the lower Jaw is to be depressed, the above mentioned Muscles are relaxed.

The Digastrics by their Situation, and the Direction of their Fibres appear to be the sole Muscles that serve to this Motion. Each has two Bellies, from whence comes their Name. The first is inserted into a Fissure before the Mastoid Process. It terminates by a Tendon, that gives Rise to a second Belly, which is attached by it's flat Aponeurosis to the superior Part of the Os Hyoides, and proceeds to be inserted by it's other Extremity to the internal Part of the Symphysis of the Chin. The middle Tendon passes in a Bifurcation made by the Division of the fleshy Belly of the Styloid Muscle. The Platysma Myoides, though cutaneous, may assist; as also several others, whose fixt Point is at the Side of the Os Hyoides, and the other at the Symphysis. This Bone in some Cases is fixed by the Muscles, that attach it to the Sternum, &c.

The lower Jaw may move laterally, viz. the Condyles with the intermediate Cartilages may slide transversely in the glenoid Cavities. Those Motions are performed when the Jaw is nearly closed; they may be called Motions in a Groove. They depend upon the alternate Contraction of the external Pterygoids. They are common to Children, and those afflicted with Convulsions.

Besides these Motions the lower Jaw, being opened, is carried from the left to the right, and from the right to the left, for Mastication. When the Opening of the Jaw is spoken of, it is only to be understood to be opened as much as is necessary for chewing. In these Motions the Condyles are carried forwards, and the intermediate Cartilages slide over the transverse Eminence to the Fore-Part. These Motions appear to be executed chiefly by the external Pterygoids. The Obliquity already remarked in the internal Pterygoids, slightly relaxed, might somewhat assist therein; this appears probable by the Motions that are made to the lower Jaw, when all those Muscles are taken off.

The external Pterygoids are placed under the Bellies of the internal. Their Direction is more oblique than transverse. One Extremity is attached to the external Ala of the Pterygoid Process, and the other to the little Depression before the anterior Part of the Condyle.

It is proper to observe, that betwixt those two Muscles is a Ligament, that covers the bony Canal through which enter the Vessels and Nerves, that are distributed in the internal Part of the lower Jaw, which is attached by one very large Portion below this Canal, and by another terminates at the Notch where the external Muscle of the Malleus is lodged, with which it communicates by some of it's Fibres.

We will speak of that Communication in the Symptoms attending the compleat Luxation of the Jaw.

Nor ought we to forget, that the Crotaphites are inclosed in a Sheath of the Pericranium, and are covered with a tendinous Membrane, &c.

It has always been known, that the lower Jaw is subject to two Species of Luxations.

The Luxation is compleat, when the Condyles have quitted the glenoid Cavities of the Temporal Bones, so that the Motions of the Jaw can no longer be executed, whereby it is considerably removed from the superior, and notwithstanding the Distance between the Jaws, the Teeth answer each other.

The Luxation is incompleat when one Condyle is forced out
of

of it's Cavity, either laterally, or forwards, when a Depression appears, or is felt on this Side, and the opposite Condyle is pushed outwards; this is known by a greater or less Eminence. This Change of the natural Situation occasions the Jaw to be carried to the Side opposite to the Luxation.

In this Case the Teeth are no longer parallel to those of the superior Jaw; the lower Jaw is less open, but it is side-ways, and more on this opposite Side than on that of the Luxation; lastly, the Motions cannot be performed.

When the Luxation is compleat, the Condyles are intirely carried to the Fore-Part of the glenoid Cavities; the lower Jaw, by it's great Distance from the superior, rests upon the superior Part of the Thorax, and obliges the Levator-Muscles to relax, and yield to the Force exerted upon them; this happens chiefly to the Crotaphites, which are the most removed from the Articulations, and which renders the Temples flat. The coronoid Processes, that are in the natural State more inclined forwards, pass from under the zygomatic Processes near a Fingers Breadth on each Side; this occasions the Tendons of the Crotaphites to change Direction, and to be removed from the perpendicular Line.

The Masseters and internal Pterygoids are less elongated, because they are placed upon the neighbouring bony Surfaces of the Articulations. The external Pterygoids are a little extended.

The Cheeks are flat, and drawn a little inwards; the Saliva flows involuntarily by the Compression of the posterior Part of the Jaw of the Parotids; but as this Pressure acts only upon a Portion of these Glands, the Secretion cannot be intercepted thereby; this occasions the Saliva to be very copious, and the Patient cannot swallow for it's Tendency to flow out, and for Want of the Motion of the Tongue, and Lips. Besides, the salivary Ducts, as also their Mouths are so disposed as to facilitate this Flux; and though the lower Jaw be at a very great Distance from the superior, the Buccinator-Muscles, the Direction of whose Fibres is transverse from behind forwards, can but slightly compress these Mouths. The Tongue cannot move, as before mentioned; being kept backwards by it's own, and the neighbouring Muscles. The Patient cannot speak, as he is unable to apply it to the Roof of the Palate, which renders that Part very dry, and particularly the anterior, which is unprovided with Glands. The Air likewise contributes thereto. The Patient loses the Power of Mastication, he is restrained to fluid Aliments, yet them he uses with Difficulty,

which is owing to the little Elasticity, the fleshy Fibres, that form the Pharynx, then have.

In the incomplete Luxation, the Jaw is carried to the opposite Side of the Luxation, the Mouth is half open, the Teeth are no longer opposite to those of the superior, as we have remarked in speaking of the Species of Luxations; the Patient can talk, but he lisps, as happens to those threatened with a Paralysis of the Tongue, the Saliva overflows the Patient's Mouth, as it is retained by the Lips which are slightly separated; they are drawn side-ways, the Tongue cannot collect it, and therefore it of course flows involuntarily.

The Situation of the luxated Condyle, having quitted it's Cavity with the intermediate Cartilage, is forwards, and out of the glenoid Cavity; the coronoid Process is then slightly removed from the Junction of the Os Malæ with the Os Maxillare; the opposite Condyle is placed upon the Root of the zygomatic Process, and the removed coronoid Process is thrown outwards. In Consequence of this Situation, it must be conceived, that the crotaphite Muscle of the luxated Side is elongated, and the Temple flattened, and that on the contrary Side, the Tendon of the temporal, the Masseter, and Processes form a Projection outwards.

In order to be certain whether the Luxation is incomplete, we are to try to raise or depress the Jaw, which gives the Patient extreme Pain.

If what has been said of the Structure of the lower Jaw, and it's Articulations is attended to, it will be seen, that there is some Difference between the Causes of it's Luxations, and those of other Joints. First, Practice shews us, that all Articulations by Enarthrosis, as the Arm with the Cavity of the Scapula, the Wrist with the Fore-Arm, the Thigh with the Acetabulum, are greatly exposed to Luxations. This last notwithstanding differs particularly, because the Head of the Femur is received in a deep Cavity. These Luxations commonly happen by Blows, but chiefly by greater or less Falls. It is also necessary, besides the Shock, that the Part be so situated as to permit the Head of the Bone to quit it's Cavity. Secondly, we know Articulations by Enarthrosis that are never subject thereto, and which, when they happen, kill the Patient. The Example that may be given thereof, is the Articulation of the Clavicles with the Sternum, as I have seen twice. Thirdly, as for Ginglymoid, or Hinge-Joints, we may with Certainty affirm, that they are very difficult and rare, and are not so frequent as Authors have related. It is true, that a violent Con-

Contusion, a Sprain in a Joint, lastly a Relaxation of the Ligaments, which connect the articulated Pieces, are frequently taken for a Luxation.

Let us return to the Luxations of the lower Jaw. They are generally produced by external, and internal Causes.

That a Luxation of the lower Jaw may be compleat by an external Cause, it is necessary if it be owing to a Blow, that it be separated from the superior, otherwise it must be presumed, that it will rather be fractured than luxated. The Space betwixt the Condyles deadens the Force upon the Articulations. Besides, it is articulated by a *Ginglymus* different from the others. Secondly, if the Luxation is occasioned by a Fall, it must be allowed to be more easy: Experience proves it. When in descending a Stair-case, or a Mountain, we fall forwards, we commonly open the Mouth to cry out; then the Jaw being opened may be fixt, and the whole Weight of the Body may act upon the Resistance that retains it; it must absolutely happen therefore, that the Levator-Muscles yield, and the Condyles quit the Cavities to be carried forwards. The Resistance being overcome, the whole Body follows the Way it tended.

The same Cause may occasion the incompleat Luxation, the Resistance acting on one Side only, the Body flies topsy-turvy, and the Luxation happens.

That which produces the following Luxation ought to be ranked amongst external Causes. For Instance, a Person is surpris'd with an agreable Thing, and laughs immoderately, then the Levator-Muscles are so relaxed, that their Antagonists, though weaker, force the Condyles to quit their Cavities; by this Means a compleat Luxation happens to some, and an incompleat to others.

The internal Causes are the Relaxation of the Muscles, and Capsule of the Joints of the Jaw. Frequent and strained Yawnings produce these Luxations, and it is these sudden Motions, that generally occasion them.

The Prognostic is taken from the Symptoms happening at the Time of the Luxation, it is not the same at other Times; for, if the Luxation has remained some Days unreduced, it is more terrible. It is also necessary to attend to the Species of Luxation; the compleat is more dangerous than the incompleat.

When the Luxation is compleat, the Patient suffers Draggings occasioned by the Tension of the Muscles; Convulsions in these Parts by the Tension of the Nerves, and principally from that sent off from the third Branch of the fifth Pair, which enters into the Canal of the Jaw to be distributed to

the Teeth, and which afterwards passes out by the Hole in the Chin, to be lost in the lower Lip. As this Nerve anastomoses by different Filaments with the inferior Branch of the Portio dura of the Ear, it follows that, when the Reduction is delayed, the Patient must feel a Numbness in the whole Extent of the Chin. He is also seized with Pains more or less acute in the Ears, which is owing to the Tension of a Filament of this Nerve called Corda Tympani, that rises from the third Branch of the fifth Pair, that goes to the Tongue. This little Nerve accompanies a Portion of the Ligament to enter into the Tympanum which it passes through, and goes to anastomose with the Trunk of the Portio dura. The Patient is hard of Hearing, because the above-mentioned Ligament is drawn to a great Distance from it downwards by the Jaw. The external Muscle of the Malleus, with which it communicates by some of its Fibres, is likewise extended; this changes the natural Situation of the Membrana Tympani, and intercepts the several Vibrations of the Air, that are made thereon. In the End the Fever comes on, the Patient becomes comatose, which is owing to the Proximity of these Nerves with the Brain; the Vomiting succeeds, by the Pain and Inflammation of the Pharynx; which it communicates to the internal Membrane of the Oesophagus, from whence it passes to that of the Stomach; and, as he cannot swallow solid Aliments, no more than his Saliva, it is not strange, that the Efforts in the Fibres of the Stomach produce a bilious Vomiting. The Symptoms must be milder in the incomplete Luxation. It is said, that if the Reduction is not quickly performed, the Patient dies the tenth Day; this does not appear hard to be believed, as the Gangrene would not fail to attack such delicate Parts.

When the Species of Luxation is known by the above-related Signs, all the necessary Means must be employed to reduce it.

The complete Luxation is easy to be reduced, on Account of the Facility, wherewith the Surgeon can introduce his Thumbs into the Mouth. In order to effect it, the Patient is placed upon a Stool, or a Chair whose Back allows the Head to be reclined a little Backwards, to be secured against the Breast of an Assistant. A Pillow, or such a like Thing is placed betwixt the Head and Breast, to prevent the Patient from being hurt against the Buttons of the Assistant; he embraces the Patient's Forehead with his Hands, engaging his Fingers in one another. The Head being thus secured, which is called counter Extension, the Surgeon places himself before the Patient, and after he has examined, whether the Height of

of the Head is not contrary to the Motions, he must make to the lower Jaw, in order to bring back the Condyles into the glenoid Cavities; he guards his Thumbs with a Band, to be more firm, or for Fear of being wounded by carious Teeth. He is to carry his Thumbs as far back as possible upon the last Dentes Molares on the flat Side. Then with the four Fingers of his Hands, he embraces the under Part of the Chin on each Side. The Jaw thus held, the Surgeon draws the Condyles from upwards downwards, and from forwards backwards. As soon as he perceives the Muscles obey the Extension, he gradually raises the anterior Part of the Jaw. This Motion disengages each Condyle from the little flat Surface at the fore Part of the transverse Brim. Then moving the anterior Part of the lower Jaw towards the superior, he obliges the intermediate Cartilages and Condyles to re-enter into the glenoid Cavities. The Surgeon must on that Occasion press with the Thumbs upon the Dentes Molares, that he may not be wounded by the Clinching of the Teeth.

The Reduction being effected, the Dressings are applied, which consist of a Compress cut according to the Figure of the Jaw. It is wet in Brandy and Water, in Wine, or other Liquor. Over this is placed the Sling, whose middle Part embraces the Chin. The two first Heads are raised, which are carried along the posterior Part of the Cheeks, passing over the Articulations, and are fastened to the Patient's Night Cap; the other two Heads are reversed over the first, and crossed as they are carried upwards, in order to be likewise fastened to the Cap, &c.

As to the Reduction of the incompleat Luxation, it is much more troublesome than that of the compleat, because it is not easy to push the Thumbs upon the last Dentes Molares. It is true, the luxated Side is opener than the opposite, but, the Change of Direction of the Muscles not being considerable, they have preserved great Force by Reason of the small Distance betwixt the Jaws; this occasions the Difficulty. That the Reduction may be effected, the Patient is to be placed, and held as above-mentioned. The Surgeon must put a Spatula or a Piece of flat Wood covered with Linen, upon the Dentes Molares of the opposite Side. With either he removes and depresses the lower Jaw from the superior, performing by this Motion the Function of a Lever. The Jaw being a little separated, the Thumbs are introduced as far back as possible, but chiefly on the luxated Side; the same Motions are used as in the compleat Luxation, except that they must be stronger on the luxated Side. When the Condyles are known

to be disengaged, and more free, there is Room to place the Chin opposite to the Partition of the Nose, that the Teeth may answer to those of the superior, and by the Motion that is made to draw the lower Jaw forwards, by bringing it near the superior, the luxated Condyle re-enters freely into the glenoid Cavity.

The Apparatus and Pandage are the same as for the complete Luxation.

Of the Luxation of the Vertebrae; of the Concussion of the Spine; of the Curvature of it's Canal, and of the Formation of Bumps.

WE have spoken, in Article V. of Chapter VI. of the First Book, of the Fracture of the Vertebrae; we will in this Section treat of the principal Disorders, that may happen to the bony Canal which they compose, and we will begin with it's Luxations.

I. Of the Luxation of the Spine.

IN order to know whether the Spine can be luxated, we must be previously instructed in the Mechanism of it's Motions; let us therefore examine how they are performed.

It is commonly said, that the Vertebrae may be dislocated either by an internal, or external Cause.

An internal Cause may force them out on all Sides; but, to speak according to Rule, that Accident cannot be called Luxation, but Gibbosity, or Bump.

As for Luxations from an internal Cause, it is not easy to conceive how they are possible, when we attentively consider in what Manner the Vertebrae are connected with one another.

Their Bodies being joined by supple Cartilages, about two or three Lines thick, form a very strong Synchondrosis, which can never allow one Vertebra alone to be forced out of the Place it occupies between two others, and to be carried inwards, or laterally; a Truth we shall be still better convinced of, if we observe in what Manner the oblique Processes are mutually set in one another, and, that besides this mutual Intarticulation, the spinal Processes in the Back are so placed on one another, that to depress one, the Spinal, and oblique Processes of some Vertebra, and especially the first, would necessarily be fractured.

It might be objected, that the lumbar Vertebrae are at a greater Distance; the Cartilages that join them being very thick;

so

so that their spinal Processes are not supported on one another, and consequently that they may be easily luxated.

But this Objection may be answered by observing, that their oblique Processes have a more distinct Articulation, and they are set so deep in one another, that it would be absolutely impossible to avoid fracturing them, in depressing the Body of one Vertebra inwards.

It is also true, that all compleat Luxations of the Vertebrae are mortal, and, to speak properly, they ought to be less regarded as Luxations, than as Fractures, and Depressions, which cannot be cured, and are more or less fatal, according to the greater or less Violence of the Impression of the Cause.

What Disorder then can external Causes, as Blows, Falls, &c. effect on the Spine? This Disease is similar to what happens to the Foot in a Sprain, and Diastasis; that is, the Cartilages are hurt and contused, their Ligaments are extended and squeezed, the mucilaginous Glands of the Articulations of the oblique Processes are compressed, and if the Shocks are violent, the Fibres of the Cartilages and Ligaments may be lacerated.

All violent Flexions of the Spine produce the same Accidents, from the eleventh dorsal Vertebra to the first and second lumbar one, because all the Motions of Flexion and Extension of the Body are performed precisely upon them, and as they are in the lumbar Region, we ought not to be surprized that these Efforts are commonly called Twists of the Loyns.

By these Disorders the most injured Part of the Spine becomes painful, and by the supervening Inflammation the Cartilages swell, occasion a Tumor, and the Articulations are filled up with viscid Matter; and those are the Wedges Nature makes use of to displace these Vertebrae, and to form the Beginning of a Bump, which will be forwards, backwards, or laterally, according to the different Places that have been hurt.

When these Accidents are produced by the violent Impressions of external Causes, let them appear ever so great, in Case the Marrow be no Ways injured, the Cure may be successfully undertaken; but, let the Marrow be ever so little hurt, the Parts below will become paralytic; these Diseases are very tedious, dangerous, and frequently mortal. There is then neither a compleat nor incompleat Luxation of the Vertebrae, according to the natural Idea we have of that Disease; there is only a Diastasis in Respect to the Cartilages, and as to the oblique Processes they are only half opened. The first cervical Vertebra must nevertheless be excepted, it is subject to a Twist, called wry-necked, that is, it is exposed to an Extension laterally. Its Ligaments and surrounding Muscles being violently extended,

extended, the Head remains inclined Sideways, but it is not a true Luxation.

As some have advanced, that in the Flexions of the Spine, two oblique Processes may get out together, or one may quit it's Place, and the other remain nearly in it's proper Situation; I will examine their Opinion.

First, To make one oblique Process alone quit it's Articulation, the Ligament that embraces it must stretch more than six Times beyond it's natural Extent; which can never be done suddenly without rupturing. Secondly, Though the Ligament should be ruptured, this great Separation could never happen neither to one, nor several Vertebrae in a living Person, in what Situation soever he was, unless he was struck violently across the Belly, as Hippocrates has justly remarked. Now this Blow would kill before it reached the Vertebrae; and, to bend the Spine to the Degree necessary to effect this Luxation, all the Viscera should have been removed, which can only be done in a dead Body, or on a Skeleton. Thirdly, Though these Shocks should have separated the oblique Processes of one Vertebra beyond the Limits of the oblique Processes of another, it would not follow, that it was luxated, since it may be restored to it's natural Situation, by erecting the Spine. It is necessary then, fourthly, in order to accomplish the Luxation, that, besides this Separation, the oblique Processes of one Vertebra, which pass the Bounds of another, be thrown outwards, and advance upon the Edges, whilst the other Vertebra is forced inwards, and that these oblique Processes slide under the others. In this Case it would only be the superior oblique Processes of the Vertebra below that would get out, and not the inferior of the Vertebra above, as has been asserted, for otherwise this would be no hinderance, as may be seen by looking at the Skeleton. Secondly, In this Situation the Edge of the Body of the flat Part of the Vertebra below would push forward, and rest upon the neighbouring Part of the Body of the Vertebra above, which could not happen without bruising, and hurting the Cartilage, in a dangerous Manner.

It appears from the above Remarks, that these pretended Luxations have only been effected from Experiments upon dead Bodies.

Let us at present see whether, these Luxations being supposed, the Practice they have taught us for remedying of them, can be used. The following Method they propose.

They bend the Spine to elongate the extensor Muscles, that kept the oblique Processes press'd against one another, for then,

then, say they, they can no longer oppose the two Motions, that are made to reduce them, the superior oblique Processes of the inferior Vertebra passing easily under the oblique Processes of the Vertebra above, when the luxated Vertebra is push'd forwards, and the Part of the Trunk towards the Head is extended, the inferior oblique Processes of the Vertebra above are placed in the oblique Processes of the Vertebra below.

They blame those who, in reducing the Vertebrae, make Extensions and counter Extensions with Ligatures; but their Utility will be shown below; let us at present only examine the Method.

It must be remembred, that the oblique Processes of one Vertebra having passed the Bounds of the Processes of the other, the Edge of it's inferior Surface presses towards the Middle of the Surface of the other. It hence appears, that in bending the Spine to disengage the oblique Processes, the Edge of the Surface of the Vertebra below is applied more forcibly against the Surface of that above, which must increase the Contusion of the Cartilages. Thirdly, they deceive themselves in imagining, that the oblique Processes of the inferior Vertebra pass easily under those of the Vertebra above, when the luxated Vertebra is push'd forwards, and the Part of the Trunk towards the Head is extended. For, to keep the Processes disengaged, the Edge of the Surface of the inferior Vertebra must serve as a Lever, whose Point of Support is upon the Surface of the other. Thus, by pushing one Vertebra forwards, the other is depressed. For the Extension of that Part of the Trunk towards the Head, without making a counter Extension by Ligatures, only brings the two Vertebrae nearer, and leaves the same Disorder still subsisting. Moreover, in the Luxation of the last lumbar Vertebra, how would they push the Os Sacrum, and raise up the depressed Vertebra; for the Vertebra above is always depressed, unless they opened the Abdomen to apply the Hand, or some other Support thereto, as Hippocrates remarks?

It will undoubtedly be thought strange, that I propose no Method to reduce the Luxations of the Vertebrae. The Reason is, that I am persuaded they cannot be displaced; and when Hippocrates has proposed Medicines, it is very evident that his only View was to remedy the Disorders occasioned by the Sprain of the injured Parts of the Spine, and not the Luxation. For that Reason he makes use of the Term Sprain, and says, that the Spine can but be little exposed to that Accident, because these Sprains are made in an Arch, and never in an Angle, principally outwards.

II. *Of the Concussion of the Spine.*

WE have said, that the Luxations, and Fractures of the spinal Canal are more dangerous when joined with a Concussion of the Marrow. Indeed it is easy to be conceived, that by the Shocks upon the spinal Canal, the Marrow, as also the Brain, must repeatedly move backwards and forwards, and strike violently against the Sides of it's Canal, which occasions so great a Compression in it's whole Substance, that the Tubes carrying the Spirits are thereby closed, bruised, and disordered; and this interrupts their Course for some Time in the Parts below those, where the Marrow is compressed, and from thence proceeds the Numbness that is felt, which is succeeded by certain Shootings, as if the Flesh was pricked in different Places; this occasions a very troublesome Pain, and like to that we feel in the Leg, when it is long kept in an unnatural Posture. These Shootings proceed from the Interruption of the Course of the Spirits at the Place where the Marrow has been bruised; they afterwards flow at Intervals, and by Starts, in the membranous Parts; whereby some of their Fibres are separated, and others compressed, and from thence comes those Sensations of pricking. This is what happens, when the nervous Fibres are but slightly compressed. But, if the Concussion is complicated, that is, if it is accompanied with the Rupture of these Fibres, or of the Blood Vessels, the Parts below the Hurt instantly become paralytic, and several mortal Symptoms succeed it. Indeed a Cake of coagulated Blood as thick as a Crown Piece, is sometimes found betwixt the dura, and pia Mater, or between the pia Mater and Marrow.

People sometimes fall violently upon the Loyns, or Buttocks. Then all the inferior Parts lose their Motion; the Patient cannot go to Stool but by Means of Clysters, nor make Water but by the Catheter; the Gangrene comes on, it gradually reaches the Anus, and all the neighbouring Muscles, and what is more surprising, he has a good Appetite, the Respiration free, he is without Fever, and nevertheless dies.

The Gangrene generally begins at the spinal Processes, at the Extremity of the Ossa Ilii, at the Coccyx, and at the upper Part of the Buttocks; because, the Patient lying upon his Back, those Places near the Bones are more compressed than elsewhere, whereby the Course of the Fluids is more easily suppressed there.

These Accidents evidently show how necessary the Animal Spirits are to quicken the nutritive Juices, and facilitate their Distribution.

To remedy the bad Effects of the Concussion of the Marrow, we begin with Bleedings, which must be frequent and copious. Recourse is had to Vulneraries, and Preparations of Castor, Succin. Aq. Theriac. and to every Thing that can animate the Spirits; the whole Length of the Spine is embrocated with Adep. human. and—Mugil, sharpened with Sp. Vin. camphor. Sal Ammoniac, and Ol. Succin. Ol. Cerae, Ol. Petr.; lastly, every Thing is made use of to restore the Motion of the Spirits. If the Patient be a poor Man, he is laid in a Bed of Dung.

III. *Of the Curvature of the Spine, and Formation of Bumps.*

THE Spine becomes crooked forwards, backwards, and laterally. It is bent forwards in old People, and in those who in the Exercise of their Trade are obliged to keep in that Posture, as Shoemakers, Cobblers, Paviers, and Vine Dressers. It may be curved in the same Manner backwards, or laterally, in those who are obliged to remain a good while in particular Postures in long Diseases; or, by Catarrhs, and Rheumatisms upon that Part; or by lying upon the Back in moist and marshy Places. I have seen a Part of the Spine bent in this Manner. It included the dorsal and lumbar Vertebrae, and the Os Sacrum, as also the Ossa Ilia, with five of the right and three of the left Ribs. The Cartilages of all these Vertebrae were ossified, and they made but one continued Body curved forwards, and entirely inflexible. What was most remarkable, the Root of each Rib was united and cemented immediately with the Bodies of the Vertebrae.

In all Cases where the Spine becomes crooked, the Neck is bent forwards. It is also drawn that Way by the Weight of the Head; the Viscosities increase, and coagulate in the Articulations of the oblique Processes, the intervertebral Cartilages dry, and frequently ossify; the Flexor Muscles of the Neck and Loyns are violently contracted, and their Antagonists relaxed. All these Causes occasion the Spine to remain crooked, and it cannot become strait again, and has no Motion but upon the first cervical Vertebra, and very little on those of the Loyns. If the Cartilages are ossified, it is quite inflexible, and immovable. Every Thing necessary to keep the Spine in this State of Crookedness obtains in such People, to wit, backwards Wedges fixt between the oblique Processes, and forwards a Dryness of the intervertebral Cartilages. Those who are thus bent are called *Silicernia*, because the Head being always bent

222 OF THE CURVATURE OF THE SPINE,

bent downwards, they are imagined to be continually looking on the Ground.

Quite the contrary happens, when the Spine is bent backwards, for then the inter-vertebral Cartilages swell, and enlarge; the Flexor-Muscles of the Neck, Back, and Loyns are relaxed, and their Antagonists, whose Force is no longer counter-ballanced, acting with all their Power, keep the oblique Processes closely joined. Sometimes the Synovia of these Articulations is so hardened, that they have no Play. Thus every Thing conspires to keep the Spine bent backwards, and such People cannot erect themselves.

We see that, in these two Species of Crookedness, the Vertebrae are no-ways displaced, and that all the Changes happening to the Spine depend first upon this, that the Equilibrium, which ought to be between the antagonist Muscles, is destroyed; Secondly, that in the first Species of Curvature, the Synovia increases in the Articulations of the oblique Processes; and in the second, that the Cartilages enlarge; and those are the Wedges Nature makes Use of to disorder the Vertebrae. Let us now see what ought to happen by the Displacing of some of those Pieces in particular, and let us begin with those of the Loyns.

When their Vertebrae are forced out backwards, and the dorsal remain in their natural Situation, the lumbar ones form a Prominence in that Place called Bump. Then the anterior Part of the inter-vertebral Cartilages is so compressed, that it almost totally disappears, and it cannot be believed, there had been any. It is easy to judge that the Cartilages of the Bodies of the Vertebrae cannot be thus destroyed, except in old Age.

The anterior Part of the very Body of the Vertebra has been so compressed, that half of it is, as it were, destroyed. The oblique Processes open, and are filled up with Synovia, which coagulates.

And as the Vertebra in the Middle of the Arch is more strongly forced out, it likewise forms the Point of the Bump, which has nearly the Figure of a Sugar-Loaf. This Point is more or less obtuse in Proportion to the Number of Vertebrae that form it, it is obvious to remark, that those People can not erect themselves, and that they are hunched behind only.

But if the dorsal Vertebrae are displaced, they are hunched both backwards and forwards, and the anterior Bump is always opposite to the posterior; that is, if the posterior is above, the anterior is below: We must explain how that happens.

If the Bump is formed by the Displacement of the superior dorsal Vertebrae, which are thrown backwards, and if the inferior remain in their natural Situation, the Ribs articulated with

with them must follow; thus they will be forced backwards; which perhaps occasions a Depression towards the upper and fore Part of the Thorax; but as the inferior dorsal Vertebrae remain firm, they keep the Ribs articulated with them in their natural Convexity; whereby the lower Part of the Thorax appears more elevated. This likewise forms the Bump forwards, and it is always opposite to the posterior, as I have said. But, if the posterior Bump was formed by the inferior dorsal Vertebrae, the upper Part of the Thorax would appear hunched, and the lower sunk in.

In these Kinds of Bumps all the Vertebrae forming them are closely joined forwards, and their Bodies diminish so much in their Thickness, as one could not imagine, unless one saw it. Their Cartilages are almost destroyed, and their oblique Processes are greatly separated by the Synovia collected there, which is very much inspissated, and, as it were, petrified.

When the upper Part of the Back is hunched, the Neck appears sunk in, and almost hid betwixt the Shoulders; because the Bump pushing them upwards and forwards, raises up the Joints of the Arms.

Sometimes one, or both Shoulders, appear hunched. This Bump is not owing to the Spine, but only to the bad Conformation of the Scapulae, which are very convex outwards, or to the præternatural Growth of the Muscles covering them, or to the Abundance of Viscosities underneath; and this is called arched Shoulders.

These are the different Sorts of Bumps occasioned by the Curvature of all the Vertebrae of the Spine, or of some of it's Pieces. It is necessary to examine what must happen, when the Spine is curved laterally like a Bow, or a capital S.

If the Spine is curved on one Side only, it forms a Bump on that Side where the Vertebrae are thrown, and a Depression on the other Side opposite to the Bump, and the Shoulder of that Side appears very large, because it is raised up by the Ribs; this only happens when the Bump is occasioned by the Displacement of the superior dorsal Vertebrae.

If the Bump is on the right Side, the Body inclines to the left. People, who continually carry Burthens on the same Arm, and support them on this Side, or upon the Flank, are very liable to be crooked laterally, and the Bump is always on the Side opposite to that which supports the Load.

If the Spine is curved on both Sides at the same Time, so as to describe a Flexure like a capital S, it will form two Bumps, one on each Side, so that, if the Bump on the right
Side

224 OF THE CURVATURE OF THE SPINE,

Side is above, that on the left will be below, and there will be a Depreffion oppofite to each Prominence.

In thefe Flexures of the Spine, the Bodies of the Vertebrae, and chiefly their Cartilages enlarge on the convex Side; on the contrary they very evidently diminifh in Size, and Thicknefs on the concave Side, the oblique Proceffes feparate, are filled up with Synovia on the convex Side, and clofe on the oppofite.

It is apparent that this Flexure has two Caufes, like other Bumps; firft, the præternatural Growth of the Cartilages, and Bodies of the Vertebrae; on the convex Side, whilft the fame Parts diminifh in Size in a very obvious Manner on the oppofite Side; fecondly, the Collection of the Synovia in the Articulations of the oblique Proceffes of the fame convex Side.

In this Contortion of the Spine, the Thorax is likewise hunched on thefe Sides, becaufe the Ribs muft follow the Vertebrae, and then the Bump of the Thorax is always on that Side where the Bump of the Spine is; and if there is one on each Side of the Spine, one above and the other below, there will alfo be one on each Side of the Thorax, and the Sternum will follow the Flexure of the Spine.

The Caufes of all thefe Sorts of Bumps are Blows, Falls, or violent Compreffions of the fpinal Parts; Fluxions, Abfcefles, and Tumors on the Junctions of the Vertebrae, all violent and extraordinary Flexions, and Extensions of the Loyns.

All thefe Caufes act with greater Force on Children, becaufe in them the fpinal Pieces are tender and pliant, likewise do we fee them more eafily hunched, by keeping themfelves crooked in walking, reading, or writing; or when the Nurfe does not take Care to keep the Leading-string ftraight, when ſhe makes them walk.

I have explained as well as I can, how all thefe Caufes produce thefe Diforders; and I have compared them to thefe that occafion Sprains in the other Joints.

I muft not forget to remark, that in all the above-mentioned Flexures, and Curvatures of the Spine, the Marrow is not compreffed, and that, the greater the Number of Vertebrae are difordered, the lefs need we to fear it's being hurt.

Befides all thefe Bumps, there is another Species, that does not depend upon the Spine; that is the Reafon, thefe People, who have them, are fimplly hunched forwards, and not backwards; which is owing to the Depreffion of the Middle of the Ribs.

In thefe the Sternum projects forwards, and hence why they

they are called Capon Stomachs. This Disposition is either owing to the Fault of the Midwife, who has handled these Parts too roughly at the Time of Birth, or to the Nurse who compresses them too violently in Swaddling, or in carrying the Child; or lastly, it proceeds from the bad State of the Ribs and intercostal Muscles, as in rickety Children. Of all Bumps these last only have the Respiration much interrupted.

These Diseases are very obstinate, if not remedied in the Beginning; and, as they are not perceived 'till they have made some Progress, they are generally incurable.

This Disease is much more common to Children, than People advanced in Age; so that, as soon as we perceive it, we must apply the Remedy.

First of all the proper Situation is to be consulted; that is, the Child is to be kept in Bed nearly horizontal, lying upon a Plank slightly quilted. For, so long as he shall stand, or walk, as the Spine does not bear perpendicularly upon the lumbar Vertebrae, their Disorder and Curvature will visibly increase. The Bump must be covered with a resolvent Plaister. The Child is to be frequently purged with Hydragogues suitable to it's Age and Constitution, and a Seton is to be made in the Nape of it's Neck; the Plaister is to be removed every Day, and the Part anointed with Grease, sharpened with Ol. Junp, and Ol. Lumbric; and if it is painful a Cerate with Sperm. Ceti, diaphoretic Antimony, and anodine Oils is to be applied thereto; and when the Pain is abated, and the Synovia dissolved, the displaced Vertebra is to be forced back by the Thumbs. This Method must be continued a Month, or five Weeks, Care being always taken to order frequent Purging, and some dissolving Opiate. When all is prepared, we try to keep the Part reduced, or reduce it, by some proper Machine, as Stays of Iron Wire, Whale-bone, or others.

Though we seldom see Bumps in Adults from an internal Cause, yet sometimes we do meet with them, but they are more generally owing to external Causes, as forced Postures, and Situations, and extraordinary Motions of the Spine. These two Causes always act in concert to form Bumps, and when the vertebral Ligaments and Cartilages are relaxed by a rheumatic Fluxion, we conceive them to be more easily disordered by the above-mentioned Causes.

It is proper to observe, that those People hunched by the Disorder of the dorsal Vertebrae have not the Respiration incommoded, nor their Lungs constrained, as is commonly said; for, if the Capacity of the Thorax be diminished on one Side, it is enlarged on the other; this may be easily demon-

frated by measuring it with a Compass. The Reason of which is, that the Ribs always preserve the same Convexity, and, if they diminish the Cavity of the Thorax forwards, they in return render it deeper backwards; lastly, if the Spine is distated on one Side, and the Thorax is streightened there, the other is enlarged. Now the Lungs being pliant, and flexible, easily adapt themselves to all these different Convexities of the Spine and Thorax, and the more as these Bumps form very slowly. Nevertheless, if they come on suddenly, the Respiration is at first a little incommoded, because the Lungs have not had Time to accommodate themselves to the Figure of the Thorax; but the Respiration is insensibly re-established. From thence we easily see how some People are more affected than others.

Though the dorsal, and lumbar Vertebrae, the Os Sacrum and Offa Ilii be ossified, Persons attack'd with that Disease are indeed deprived of the Power of Flexion, and Extension, but the Trunk can be moved upon the Articulations of the Thighs. The first cervical Vertebra has been frequently seen ossified with the Condyles of the Os Occipitis, and even all the rest with one another. I will relate a very singular Example thereof. It is necessary to recollect, that in the natural State the Tooth-like Process is received in the Cavity at the internal Part of the first Vertebra. It is connected thereto by lateral Ligaments. Besides which, one goes off from the Extremity of the Foramen occipital, which covers it, and is lost upon the Body of the second Vertebra. The Membranes going out from the Brain with the Marrow pass in this Place; thus if the Tooth-like Process is displaced by any Cause whatsoever, the Animal perishes almost instantly by the Compression of the Marrow.

OBSERVATION.

SOME Years ago I had an Opportunity of having a Head, where the six first cervical Vertebrae made but one continued Piece with the Head, being all ossified. The Body of the first was push'd forwards. It left two Apertures, one above of an oval Figure, and the other below, large enough to receive the little Finger. The second Vertebra was thrown backwards with the Tooth-like Process, so that this Process was no longer articulated with the first Vertebra, being removed from it above two thirds from the Entrance of the Canal, and the same Process left only about the Space of two Lines from it, at the posterior Part of the first Vertebra, from whence it must be concluded, that the Marrow of this Man when living, had

had been compressed, the Diameter common to the Canal being diminished two Thirds. We can with no Certainty determine, what could be the Cause of so particular a Case, unless the Person had been hanged, which Extension had occasioned the Ligaments to relax, and the bony Juices to remove the Process gradually. By this Means the Marrow must have been insensibly affected and compressed. In that Case the Person must have remained incapable of Motion. It must also be presumed, that he continued long an Invalid, as all the Vertebrae were ossified. It may even be supposed, that he continued paralytic. People have been seen, who after having been hanged, have remained with their Neck bent down laterally; but in those who die this Death by the Hand of Justice, it has been very often remarked, that the Vertebrae are separated, but never the first nor second; it is always the third or fourth, and this Separation is occasioned by the Shocks of the Executioner. The mere Weight of the Body does not produce this Effect.

ARTICLE H.

Of the Luxation of the superior Extremities.

I. Of the Luxation of the Arm.

ALMOST all Authors, after Galen, pretend that the Head of the Humerus may be luxated four Ways, to wit, upwards, downwards, forwards and backwards. But if the Structure of this Joint, and the Disposition of it's surrounding Parts are considered, it will be easily seen, that the Arm cannot be luxated upwards, backwards, and forwards.

In order to form a just Idea of these Disorders, it is necessary first to understand well the Structure of the bony Pieces of this Joint, the natural Situation and Function of it's surrounding Muscles; and this must be learnt not only on dead, but likewise on living Subjects.

I remark first, that there is a vast Difference between the Articulation of the Arm, and that of the other Bones. The Head of the Femur, for Instance, is included in a very deep Cavity that is entirely bony, whereas that of the Arm is so placed, that the Surface is but small; which rests in the Center of the superficial Cavity of the Scapula. This Difference immediately shows us, that the Motion of the Arm must be more free in all Directions than that of the Thigh.

The Thigh indeed can move on all Sides, but it is easy to

judge, that the bony Brims of it's Cavity confine it's Motions, whereas the Arm can move upwards, downwards, to the right and left, because the Cavity that receives it is obsequious. I mean by Obsequiousness the Mobility of the Scapula, which obeys equally in all Directions.

This Disposition of the Joint of the Arm gives it great Freedom in all it's Motions, but then it renders it less firm, and more subject to be luxated. Therefore has Nature endeavoured to remedy it; first, by so disposing most of the Muscles of the Arm, that their Tendons firmly embrace the whole joint; secondly, by placing the coracoid Process, and Acromion above this Joint in such a Manner, that they form a Kind of Arch, under which the Humerus is lodged, whenever it is forced upwards.

It is also necessary to consider the Situation of the deltoid Muscle, and in what Manner it embraces the Joint forwards, and laterally. This Muscle, whose greatest Portion rises from the Acromion, opposes the Luxation upwards, as also the fore-mentioned Processes. It likewise somewhat resists it forwards by the clavicular Portion. Besides, the longus Extensor Cubiti likewise opposes the Luxation backwards, and one Head of the Biceps, with the Coraco-brachialis resists it forwards.

Hippocrates fairly owns, he never saw the Luxation of the Arm but downwards; and, we easily come into his Opinion, when we know how difficult it is upwards, backwards, and forwards; unless the solid Parts composing the Joint be fractured, and it's surrounding Muscles lacerated; for in that Case nothing is impossible.

If those who have contradicted this Opinion had carefully examined the Limits of the Exit of the Bone; that is, the Cavity from whence it ought to pass out, the Violence that occasioned it, and the Situation the Patient was in at the Time of the Luxation, they would easily have found out their Error: For it is necessary to remark, that there is a very great Difference between the Manner in which the Dislocation is made, and the Situation the Bone is found in after it is effected. Nevertheless, in that consists the Master-Piece in reducing all kinds of Luxations with Certainty, and this cannot be known but by asking the Patient, whether the Accident happened by a Blow, or a Fall.

That the Head of the Humerus may be luxated upwards, forwards, or backwards, it is necessary that in the Shock, or Fall, the Patient's Arm be not at a great Distance from the Ribs, and that the Wrist, or Elbow bear perpendicularly, and
in

in a straight Line, either from downwards upwards, or from backwards forwards, or from forwards backwards.

Now in all these Situations the Head of the Humerus will always press either against the Acromion, or coracoid Process, or against the Middle of the Arch they form. If it is forced directly upwards, the coracoid Process and Acromion, the Ligaments and Attachments of the deltoid, will oppose that Luxation. If it is pushed outwards, the Acromion resists it; and if inwards, the Head of the Bone is stop'd by one Head of the Biceps, by the Coraco-brachialis, and coracoid Process. Now these Obstacles are very powerful. Nevertheless, that the Head of the Bone may quit it's Cavity in this Direction, they must be overcome; which cannot be effected without shivering the Bone; but then the Portion of the Acromion, for Instance, that has been fractured, obeying the Contraction of the deltoid, and other Muscles, that are attach'd to it, and assisted by the Weight of the Arm, the Bone frequently re-enters of itself into it's natural Place, as has been often seen. Nevertheless, this Disease is not of less Consequence than the Luxation; for all Fractures of the Joints are always very troublesome, and the Motion in Consequence thereof is totally lost, as has been said. I do not deny, notwithstanding, that the Arm may be luxated forwards, and sometimes backwards; but the Head of the Bone always gets out downwards, and it happens in this Manner.

The Arm in general is only luxated when it is separated from the Ribs; it slides downwards with greater Ease, than by any other Place, because the Center of the Bone being out of it's Support, it is easily forced under the Axilla, where it meets with no Resistance; the Cavity of the Axilla being only filled with Fat and Membranes. Wherefore, if the Fall is very violent, and the Elbow is pushed upwards, the Head of the Bone will be forced downwards, being determined that Way by the Resistance of the coracoid Process, and Acromion. But, as the Patient feels great Pain at the Instant of the Luxation, and the Joint is suddenly arrested, he sometimes makes a violent Effort with it to examine whether it is wounded; and at this Instant, the Bone already fallen under the Axilla, having no solid Support, and whose surrounding Muscles are still supple, and obey easily, is thrown forwards, or backwards, according to the Motion of the Patient, but especially forwards. This may likewise happen by a second Fall, or by the Attempt of Persons ignorant in handling these Sorts of Luxations, who pull the Arm so violently, as to change

the Situation of the Head, and force it forwards under the Pectoral, or backwards into the infra spinal Cavity.

It is agreed then, that the Arm may be luxated forwards, but rarely backwards, in which very Case the Head of the Bone has always slipt out below.

Galen says, he once saw it at Smyrna, and four Times at Rome; and Paré certifies, he only saw it once.

As the Arm is most frequently luxated downwards, we will carefully examine all it's attending Signs.

Signs of the Luxation of the Arm fallen under the Axilla.

First, the Acromion appears more elevated, and sharper, especially in thin People; for in the Plump, or when there is a violent Contusion, nothing can be distinguished near the Acromion. The deltoid Muscle is more distinct, and it's Sides form as it were two extended Cords, whilst the Middle appears flatter. A Cavity is seen in the Joint, and a Tumor is formed under the Axilla by the Head, that is thrown there; and, if the Head cannot be felt on Account of the Contusion, we can easily judge where it is lodged, by following the Direction of the Bone. By this Means it is easily discovered to be situated lower, and nearer the Skin. The Arm is a little raised, because the deltoid is extended, as it is farther removed from it's Support, and has quitted it's ordinary Place, and only meets with a feeble Resistance from it's Antagonists. The Arm is slightly removed from the Ribs, and cannot be brought near without Pain, because the Head of the Bone is lower than common. There is room to suppose, that the Head of the Humerus being displaced, the Pectoralis, Serratus major anticus, and latissimus Dorsi, are injured more or less, some by the Compression, and others by the Change of Direction in their Fibres. For which Reason the Patient is relieved, when the Arm is raised, and the Elbow a little bent, because the Head of the Biceps, rising from the coracoid Process, is push'd inwards, and bent, and consequently pulls the Fore-Arm. When both Elbows being bent are compared, that of the luxated Part appears longer in Proportion to the greater or less Descent of the Bone; for it may get up again, and the Elbow may appear nearly of the same Length. The Arm is longer, because the Head of the Bone is below the Cavity of the Scapula. The Elbow is thrown outwards, and a little raised, and removed from the Ribs, and cannot be brought near without Pain, because then the deltoid Muscle is obliged to elongate; now it is already but too much, on Account of it's great Distance from the Support.

port. The *supra spinatus* does not contribute less thereto. The Elbow keeps bent, because the Head of the *Biceps*, coming from the *coracoid Process*, is forced inwards, and consequently removed from it's Insertion.

At first the Patient cannot move the Arm, but he can afterwards perform all Motions, except that of raising, or removing it from the Ribs, which he cannot perform, because the Fibres of the *deltoid* being strained gradually, by the Weight of the Part, their Spring is weakened insensibly.

If after a Luxation downwards the Head of the Bone is carried forwards, it lodges under the *pectoral Muscle*. In this Case the Motions of the Arm are more difficult than in the first; it is gradually perceived to receive no more Nourishment, the Arm is drawn backwards, because the Muscles serving to this Motion are most in Tension, and the same Changes are seen in the Joint as in the preceding Luxation.

When the Luxation is backwards, the Head of the Bone is placed under the Spine of the *Scapula*; the *coracoid Processes* appears very sharp, whereas it is scarcely perceptible in the other Luxations. The Depression of the Joint is more distinct; the Arm is brought near the Breast, because the *pectoral Muscle* is most in Tension, and the Patient is in Pain when it is removed, because the Fibres of this Muscle are strained.

PROGNOSTIC.

All the Species of Luxations of the Arm are rarely accompanied with bad Accidents, especially when they are recent; for there are few, but what may be reduced by taking the proper Precautions. First, it is necessary to know, that, when the Head of the *Humerus* is simply lodged under the Cavity, let the Arm be raised ever so little horizontally, it may be easily disengaged by the Extension; then it is brought back with the Fingers without Fear of Accidents. Secondly, if it is placed forwards, and not very far advanced under the great *Pectoral*, it will be drawn back with little Force, and without Accidents. Thirdly, it is the same when it rests upon the Spine of the *Scapula*, and outwards; nevertheless, a little stronger Extension is necessary, to save the Patient Pain.

We are to direct the different Motions that must be made to the Head of the *Humerus*, to bring it back opposite to the Place through which it passed, in order to make it re-enter.

It is not the same with the following Luxations.

The Luxation where the Head of the *Humerus* is very much wedged in the *Axilla*, is very difficult to be reduced. By it's Lodgment there, besides the Pain it gives the Patient,

which is accompanied with a greater or less Degree of Numbness, it compresses the Glands that fill up the Axilla, this obstructs the Course of the Lymph, which extravasates in the adipous Cells, and renders almost the whole superior Joint cedematous. The Skin changes Colour by the Obstruction of the venous Blood which cannot be propelled, on Account of the Compression of the axillary Trunk. We may also say, that the Numbness is owing to the Compression of the Nerves.

When the Head of the Humerus is advanced as far as the Middle of the great Pectoral, it forms one of the worst Luxations, the Prognostic of which cannot be promising for the Patient, since by it's Bulk it greatly separates the great, and compresses the little Pectoral, by Reason of which many little Vessels of all Kinds are ruptured. which occasions a greater or less Ecchymosis, or Contusion, especially in fat, and delicate People.

If the Reduction cannot be effected by the common Extensions, and counter Extensions, it is absolutely necessary to have Recourse to Ligatures, and other Machines, which too frequently occasion unavoidable Accidents. Such are a Contusion, Ecchymosis, Excoriations, smart and acute Pains, which the Patient long feels: Some Portions of the Muscles are lacerated, which cause Collections of Matter, or Abscesses. These Sorts of Accidents are very common to very plump, strong, and robust People, whose Muscles resist the Extensions. In this Case the Surgeon must make his Prognostic, and forewarn the Relations, before he undertakes any Thing, that no Imputation may lay upon him. Finally, it is very happy when the Head is reduced into it's Cavity. As to the Symptoms they are easily remedied.

Old Luxations of the Arm are very difficult to be reduced. Some are even met with, that must not be undertaken, lest they should occasion fatal Accidents. What do I say? There are some that are absolutely incurable.

The incompleat Luxations of the Humerus are easily replaced when owing to external Causes; but, though those that are from internal ones can be easily reduced, yet let the Patient move ever so little, the Head slips out of it's Cavity. This is the Difference of these two Species of Luxation; wherefore the Patient ought to submit in this last to wear a contentive Bandage, and to keep a long Time still, to give the Ligaments and Muscles Time to recover their natural Spring.

REDUCTION AND CURE.

The Reduction of the Arm requires our Attention to many Particulars. First, the Patient must be placed, and seated conveniently, as well for himself, as the Surgeon, who must endeavour to reduce the Head of the Bone. Secondly, he must be so secured, that the Extensions, and Counter-Extensions, proper to each Species of Luxation may be easily made. I am going to examine the different Methods that have been practised.

The first Method of reducing the Head of the Humerus.

When we are certain of the Situation of the Head of the Humerus, the Patient is to be seated, as before-mentioned; an Assistant holds his Body fast by a Towel, or a large Piece of Linen, with which the superior Part of his Thorax is invested. The Surgeon then raises the Patient's Arm to a certain Height, which again depends upon the Species of Luxation; for, if the Head is lodged under the Neck of the Scapula, and is not much wedged in, the Arm is ordered to be held by an Assistant above the Condyles to make the Extension, which may be in a greater or less Degree. He who holds the Patient makes the Counter-Extension. The Arm must be drawn from upwards downwards, until the Head is opposite to the Cavity. The Surgeon takes hold of the Middle of the Arm, and ordering the Extension to cease, he lowers it, and brings it near the Thorax. In this Motion he pushes the Head into it's Cavity. The Action of the Muscles likewise contributes thereto.

The Head is very frequently lodged forwards; in which Case the Arm must be placed horizontally, and carried outwards. In this Situation the Extension is made, and in Proportion as the Head is brought near to the Cavity, the Arm is drawn back, continually extended from without inwards, then the Fore-Arm is bent, and by performing the same Method as before explained. The Head is made to re-enter into it's Cavity.

If, on the contrary, the Head of the Humerus is placed outwards, the Arm must be drawn inwards to make the Extension, and the Head being placed over-against the Cavity must be push'd into it.

Sometimes the Head of the Bone is very much sunk into the Axilla. When this happens to a Person whose Arm is very large and heavy, the Surgeon is obliged to pass the Patient's Fore-Arm between his Legs, to have the Extension made;

made; and, as the Assistant appointed thereto can, as it were, only grasp the Wrist, he must, to second the Operator, apply a Ligature above the Condyles. The Surgeon provides himself with a Napkin knotted, in which he passes the Patient's Arm, in Form of a Noose, and puts it about his Neck. During the Extension, he supports the upper Part of the Arm, and with his Hands draws it towards him, raising the Napkin up with his Neck; which enables him to perform the Reduction. The Napkin is only made use of when the Luxation is lodged in the Axilla, because the Arm cannot be raised.

The second Method of reducing the Arm.

When we cannot succeed by the common Extensions, the Patient's Body is secured by a Belt like a Ligature, which surrounds it; and is fastened to a Screw placed in the Wall, or other solid Body. The Thighs are secured by a Band, to prevent the Patient from rising. This being done, a Ligature is applied above the Condyles. Two Assistants are necessary. The first takes hold of the Scapula, to secure it, and presses it from upwards downwards, so as to draw it a little backwards, as these Motions make the Counter-Extension, and keep back the Scapula. The second Assistant is designed to make the Extension. Sometimes even two are necessary to the same Ligature. During these Motions the Surgeon places himself so as to observe what passes at the Head of the Humerus, and the Progress it makes; this depends upon the greater or less Force of those that pull; so that he may be able to put his Fingers under the Axilla to embrace the Head of the Bone. When the Extension is sufficient, he depresses the lower Part of the Arm, and performs the Reduction. It is necessary to observe, that the Arm must be a little raised to relax the deltoid, and so to dispose the Head, that it may not be pushed against the Neck of the Scapula. A particular Attention is due here.

The third Method of reducing the Arm.

The Antients and Moderns have used the Ladder, or for want of it, a Door. These two Ways of reducing the Head of the Humerus differ very little. The Business is only to know whether all the Species of Luxations can be treated by this Method; this Practitioners ought to pay great Attention to, in order to avoid many Accidents, that may happen during the Operation, as Fracture, Contusion, Ecchymosis, Compression of the Vessels and Nerves, too great Extension of the Muscles, Capsulæ, and Arteries, which occasion Aneurisms, &c. The Luxation of the Head of the Humerus sunk into the Axilla cannot

cannot be reduced in this Manner, any more than those forwards, and outwards; here it only respects the Luxation of the Head simply lodged under the Neck of the Scapula.

If recourse is had to the Ladder, the Step whereon the Arm must be placed is covered with several Napkins, or Pieces of Linen, four Fingers Breadth thick, to prevent it from making any Mark upon the Patient's Skin. He is made to get upon a Chair, or Bench, and the Surgeon orders a Table to be placed on the opposite Side of the Patient, upon which he stands for the Sake of being higher. He passes the luxated Arm over the Step, and draws it towards him as far as the Axilla. The Assistants force the Patient's Body against the Ladder, which must be covered with a Napkin doubled, that he being naked may not be hurt. Being thus secured, the Surgeon moves, or orders the Arm to be moved, to loosen the Head, and gradually overcome the Resistance of the Tendons of that Part. From thence he proceeds to the Extension. When the Head begins to remove from the Place it is lodged in, the Chair, or Bench is taken away, and the Assistants take Care to let him fall by Degrees, to prevent too sudden a Shock; then he remains suspended, that the Weight of the Body may finish the Rest of the Operation. By this Means all the Accidents are avoided, and the Reduction is easily effected.

If the Head of the Bone is placed forwards, the Arm must be drawn outwards, and, if it is outwards, the contrary Motion is made, in order to bring the Head near the Center of it's Cavity. Then the Extension is lessened, and the Patient is left suspended, which facilitates the Reduction. If he is thin, the mere Weight of his Body is not sufficient to overcome the Resistance of the Tendons; then the Assistants are obliged to draw the Trunk downwards by Degrees, which Operation must, notwithstanding, be directed by the Surgeon. In Case the Patient be very plump, and the Weight of his Body too great, the Assistants support him to diminish it; during this the Surgeon tries at the Reduction, ordering the Arm to be gently drawn from upwards downwards.

If the Door is preferred to the Ladder, Care is taken to guard it well, either with a Coverlet doubled, or a Sheet that falls down on both Sides, and the same Precautions are to be taken when the Ladder is used.

The fourth Method of reducing the Arm.

The Patient is made to lay on the Ground on a Coverlet, or Mattress; or, lastly, upon a large Table. The Surgeon sits opposite,

opposite, so that his Legs are placed between those of the Patient. A little Cushion is put in the Axilla, which is kept on by a Band of a proper Length, and by which an Assistant raises the Arm, this makes the Counter-Extension. The Scapula must be secured by another Assistant. The Surgeon being seated as above-mentioned; he takes hold of the Patient's Fore-Arm above the Wrist, and puts his Heel under the Axilla, observing that, if it is the right Arm, it must be the right Heel, and vice versa. He forces the Cushion inwards with his Heel, whilst he draws the Arm forcibly to make a strong Extension. It would be better to apply a Ligature above the Condyles, the Extension would be greater, and consequently the Reduction more sure. This Method succeeds, but chiefly when the Luxation is downwards, and the Head of the Bone slightly engaged.

The fifth Method of reducing the Arm.

A large Pole, nearly like to what the Brewers use to carry their Casks on, is made use of. There must be an Eminence in the Middle, and a Hole on each Side at some Lines Distance from it, to receive a Peg about half a Foot high. The Eminence is covered with a Compress several Times doubled; the Pole is passed under the Axilla at the prominent Part, the two Pins confine, and secure the upper Part of the Arm. Then two Men taller than the Patient, place each of the Ends of the Pole upon one Shoulder. The Arm being placed, the Surgeon pulls, or orders it to be drawn from upwards downwards, holding it with his Hands above the Condyles, and the Patient being suspended, the Method proper for the Reduction is pursued. This Kind of Reduction may be referred to the Ladder, or Door; but the Accidents are not so dreadful, &c.

The sixth Method of reducing the Arm.

A strong robust Man, taller than the Patient, places himself before him, and takes the luxated Arm, which he puts upon his Shoulder; he draws it forcibly forwards and downwards along his Breast. This Extension raises the Patient from the Ground. He supports him upon his Back; during this the Surgeon tries to make the Head re-enter into its Cavity. This Manner of operating may succeed in a simple Luxation, especially when it is recent, and in young People.

The seventh Method of reducing the Arm.

There are few Authors who have not mentioned Hippocrates's Ambé. Some have considered it as very proper to reduce

duce the Luxation of the Arm, on Account of it's Ease in making the Extension; Experience nevertheless proves the contrary, because the Piece that performs the Function of a Lever, and is placed in the Axilla, does not leave sufficient Space to allow such an Extension as is necessary to extricate the Head from it's Engagement, and let it be ever so little depressed, the whole Force acts against the Humerus; which is more capable of sinking down, and fixing the Head of the Bone more closely, or of causing terrible Accidents, than of disengaging it. It is certain, that when the Head of the Humerus is only lodged under the inferior Edge of the Neck, it is not difficult to make it re-enter, by putting the second Piece of the Ambe into the Bottom of the Axilla; but that cannot be done in the other Luxations.

The Ambe is composed of two Parts. The first is a square Piece of Wood, which may be called the Pillar, relative to it's perpendicular Direction. It is supported by a large Foot, of a proper Weight to resist the Motions that must be made. The upper Part of the Pillar is open to receive a Tenon, which is fix'd to the back Part of the second Piece, where it is kept in by a Peg, that allows it the Motion of a Hinge, and consequently that of a Lever.

The second Piece of the Ambe is made fluted, of three little Plates of a proper Length. The first serves as the Bottom, and the other two form the Sides, so that it makes a Channel in which the Arm, fastened by three or four Bands, is received horizontally. The Arm, and the second Piece being thus situated, make a right Angle with the Pillar, and, when it is moved from upwards downwards, it forms an acute Angle; a Motion proper to make the Extension, counter Extension, and Reduction.

But, as the Inconveniences that lie in the Way have been found out, I have endeavoured to remedy them to render the Ambe more commodious, and easy to handle than an infinite Number of Machines, such as Muffles, Hippocrates's Bench, and others.

First, there is nothing to be changed in the Hinge, because it permits the Lever to move.

Secondly, the Sides that terminate the upper Part of the second Piece are removed, for the easier Direction in crossing; we cover them with a Piece of soft Leather, two Finger's Breadth thick, to prevent the Contusion of the soft Parts.

Thirdly, I have cut the upper Part of the Pillar, four Finger's Breadth below the Hinge. In the Middle I have placed a round Shaft, six Finger's Breadth long, which is received in a Socket

a Socket made in the Center of the Pillar. By this Reception, the Lever turns round, which makes two Motions, the one an Hinge for the Action of the Lever, and the other a Pivot to carry, and direct the Arm either inwards, or outwards, and this according to the Species of Luxation.

Fourthly, the Channel that serves as a Support to the whole Arm is lined with good Compresses.

Fifthly, the Arm is not secured by Strings. I prefer the Ligature that is used in common Dislocations, applied above the Condyles, with which the Extension is made, as will be explained hereafter.

Sixthly and Lastly, of what Species soever the Luxation be, the Ambe may be used with all Safety under the above Corrections. If the Luxation is downwards, the Arm remains immovable, the Branch that makes the Lever, and wherein the Arm is placed, must be raised to a certain Height. The Patient must be placed close to the Pillar, and kept so by Assistants, whilst another Assistant on the other Side makes the Extension, in order to disengage the Head from the Place it is lodged in. Care must be taken during the Extension to turn the Lever a little to the right and left, to facilitate the Exit of the Head. Let it be ever so little disengaged, the Extension is continued moderately, by lowering the Lever gradually until it makes a right Angle with the Pillar. The Head being got near the Neck, the crescent is push'd under the Axilla. Care being taken to keep the Arm secured, and the Lever is lowered gradually, which favours the Extension, by this Means the Head of the Humerus re-enters into it's Cavity, let the Arm be ever so little relaxed.

If the Head of the Humerus is lodged forwards, and under the great Pectoral, the Arm being placed in the Groove of the Lever, as before-mentioned; it is carried outwards by the Motion of the Pivot, and the Extension is made from within outwards, to bring the Head back near the Cavity, and it is replaced by a slight Motion of the Lever downwards. When the Luxation is outwards, the contrary Motion must be made; that is, the Arm is to be carried inwards by the Motion of the Pivot, and the Extension is made from inwards outwards to bring back the Head near the Cavity, and it is replaced by a slight Motion of the Lever downwards. When the Dislocation is outwards, then a different Motion to this last must be made, viz. the Arm is to be carried inwards by the Motion of the Pivot, and the same Operation being performed as above, the Head re-enters into it's Place.

THE APPARATUS.

The Apparatus consists first in placing under the Patient's Axilla a square Compress, two or three Fingers Breadth thick; which jets out on both Sides, that the Turns of the Band, which pass under the Axilla, may not compress the Vessels, and excoriate the Skin, as generally happens to fat People. I prefer this Compress to the Cushion, which has been commonly made use of, because it guards the whole Axilla, whereas the Cushion which is round incommodes the Patient by the Compression of the Turns of the Band, and occasions Itchings, which oblige us to remove the Dressings sooner than we should do.

Secondly, we secure the Compress by a Band two or three Fingers broad, and about a Foot long, whose Ends we cross at the superior Part upon the Acromion, or Clavicle, or else by a Sling.

Thirdly, we apply a Compress cut into a half Cross of Malta, whose Middle we place upon the upper convex Part of the Arm, and cross the Angles towards the inferior Part of the deltoid.

The Compresses are to be wet in the common Defensive before they are applied. The whole must be kept on by the Bandage called Spica, which is made of a single-headed Roller about five Ells long. We first begin it by applying the End under the external Part of the sound Axilla, to carry it to the upper Part of the Scapula of the luxated Arm, and pass it over the Junction of the Clavicle with the Acromion. We continue it forwards, and pass it under the Axilla to secure the Compress, that fills up the hollow; then we carry it up again over the external Part of the Arm towards the Junction of the Clavicle, and Acromion, where we cross in X, which makes the first Point of Support of this first Turn, and keeps the Head in it's Cavity. We pass the Band over the Fore-Part of the Breast, to come under the sound Axilla. It covers a Compress similar to the fore mentioned. We follow the first Cast of the Band, that we may go on to pass it over the upper Part of the Arm, where we make a second Cross in X, we continue it forwards under the sound Axilla, and from thence backwards, to cross upon the Arm, and pass under the Axilla, &c. The first Turns of the Band serve as a Guide for the rest. We take Care to make little Spirals downwards to form the Spica, which is a Triangle.

After we have passed the Band under the Axilla from inwards outwards, we make two Circulars round the upper Part

of

of the Arm, a little below the Spica, from thence we pass it under the Axilla, to cover the Triangle of the Spica, we carry it over the Fore-Part of the Breast, and so continue it as long as it holds out. Instead of the Sling, we bend the Fore-Arm, and make two Circulars with the Band round the Wrist, and then carry it up to the Fore-Part of the Breast, where we fasten it by Pins or Thread. We may invert it, and carry it over the Middle of the Arm, to keep it a little backwards, and fasten it about the Body. The Hand must be raised higher than the Elbow, to favour the Course of the Fluids.

II. *Of the Luxation of the Fore-Arm.*

I. *Of the Luxation of the Elbow.*

TO be assured of this Luxation, it is absolutely necessary to recollect the Structure of this Joint.

It is formed by the Junction of the Cubitus and Humerus, whose Extremities are set into one another by Means of some Eminences and Cavities, and form a Ginglymus of the first Species; the inferior articular Extremity of the Humerus, having a cave Part at it's Middle that receives, and two Eminences that are received, and reciprocally the upper Part of the Ulna having a Protuberance in it's Middle that is received, and two cave Parts laterally, that receive. This Eminence of the Cubitus moves in the Cavity betwixt the two Eminences of the Humerus, as a Cord in the Groove of a Pulley.

This Pulley-like Cavity is terminated forwards and backwards by two Cavities; the anterior is very small, and in the Flexion receives the coronoid Process of the Ulna, which being very small, permits the Cubitus to make a very great Flexion, the posterior is very deep, and receives the Olecranon in the Extension of the Ulna; which obliges it to remain extended in a straight Line with the Arm, for the Ease of the Muscles.

All this Conjunction makes the most perfect Ginglymus of the whole Body, and it is very apparent from it's Structure, that the Ulna cannot be luxated, except with great Difficulty, the Heads and Cavities serving to this Articulation being received very deep into one another.

This Joint is strengthened on each Side by two Ligaments of a very compact Texture. The one rises by a very narrow Beginning from the internal Condyle of the Humerus, and proceeds

ceeds expanding itself to it's Attachment to the external Edge of the Cubitus; the other comes from the external Condyle of the Humerus, and is inserted into the articular Ligament that embraces the Head of the Radius, and connects it closely with the Ulna.

This Joint is likewise strengthened by the Origin, and Insertion of Muscles that surround it, inwards by the brachii internus, whose fleshy Part covers the whole Joint, and by the Tendon, and Aponeurosis of the Biceps, outwards by the strong Fascia of the Extensors, and by the Anconæus, that lays obliquely betwixt both Bones, and on each Side by the Origin of several Muscles; for Example, the Extensors of the Wrist, Fingers, and several others.

It is evident from the Make of this Joint, that the Ulna can only be luxated backwards and laterally; for it cannot be easily done forwards, by Reason of the Olecranon, which is so large and long, that there is little Probability, that the Humerus can be separated by any Effort from the Cubitus, as much as is necessary to make this long Process pass over the Pulley of the Humerus, unless it has been fractured, and the Muscles lacerated. The Olecranon being broke transversely, may undergo the same Changes.

The Olecranon may be dislocated laterally, by getting upon the Condyles of the Humerus, otherwise I believe it impossible; and, if it is true that it has been sometimes met with in the internal Part of this Joint, there is room to believe it had passed over one or other of the Condyles, and had afterwards been pushed inwards by other Efforts. But this cannot happen unless the Ligaments, and several Muscles be entirely ruptured.

The Luxation of ginglymoid Articulations laterally are generally incompleat, because the Bones touch by so great a Surface, that they cannot be entirely displaced without rupturing the Ligaments, and Muscles.

When the Cubitus is dislocated internally, it is thrown outwards, and there is an Eminence externally, and a Depression on the opposite Side. The contrary happens when the Luxation is on the external Side, and this cannot happen unless the Radius be displaced, like the Rotula, and forced outwards.

The Radius being articulated with the Humerus by a small Enarthrosis, may be dislocated in every Direction; and as it is closely connected with the Cubitus, it cannot be luxated backwards, unless the Radius quits the Head of the Humerus. For which Reason, when the Ulna is reduced, it is necessary to observe, whether the Radius is in it's Place, and whether the

Patient can perform Pronation, and Supination. It is likewise necessary to take Notice, that the Radius is articulated above and below with the internal lateral Parts of the Ulna. But the Dislocations of this Bone in particular are very rare; first, because this Conjunction is very close; secondly, because it is not exposed to such frequent and violent Motions as the Cubitus, which is the only Support of all the Motions of Flexion and Extension of the Fore-Arm, whereas the Radius serves only to those of Pronation and Supination, which are weak in Comparison to the first. For which Reason, there is room to believe that the Luxations of the Radius are most commonly a Consequence of those of the Cubitus. Nevertheless, it cannot be denied, but that the Radius may get upon the internal Part of the Humerus, or Ulna, as well above as below, and those Species of Luxations when old are very difficult to be reduced. The Separation of the Extremities of the Ulna and Radius have been treated of in the Article of the Separation of the Bones.

The above-described Divisions of the Species of Luxations, both of the Cubitus and Radius, relate to those which all Authors have spoken of, down to the present Time, but with some little Differences; an exact Description of the Structure of this Joint having shewn the Impossibility of adopting them according to their Description; and, besides of all the Articulations of the human Body, there is none more solid, more firm, and more sure to resist all the Shocks, which the most laborious Exercises subject them to, as well on Account of the Resistance of the Supporters there, as by reason of the Ligaments that join, and connect these Bones together, and the strong Muscles that surround it on all Sides.

Some Authors have established Differences between these Diseases, and given particular Signs, and imagined extravagant Changes, which they say happen to the Cavities of the Ulna, and Processes of the Humerus; but what they have imagined probable, only appears so by the mere Examination, and Ease wherewith the dry Pieces are moved, and herein they have nearly followed one another. It is even observed, that some have related the most complicated, and terrible Instances, in order to revive the Species of Dislocations of the Cubitus they had adopted. Indeed Falls, Compressions, Contusions, and Blows may occasion Wounds, Lacerations, whilst the Bones shall remain articulated; but, if any Disorder happens there, it will be a Fracture, not a Luxation. The mere Structure of the Articulation of these Bones, Ligaments, and Muscles, defends it. Consequently we may say with Truth, and without

without Extravagance, that the Luxations of the Cubitus are only supposed, and that the Diseases of this Joint depend solely upon the violent Extensions of the Tendons, Ligaments, and Muscles, that have been more or less lacerated. We may also advance, that this Opinion of the Separation and Removal of the Ulna, and Radius from each other at their upper Parts, cannot be supported, unless Gun-Shot was the Cause.

The Tension, Swelling, the greater or less Ecchymosis are Obstacles that prevent our being assured, whether there is a Luxation. It is therefore to no Purpose to torment a Patient by forced Extensions, and Counter-Extensions; we are, according to good Practice, to have Recourse to Bleedings, and place the Fore-Arm commodiously, and not apply the circular Bandage, until the Symptoms be calmed. The eighteen-tail'd Bandage is the best; it facilitates the Application of such Unctions, and Embrocations, as are emollient, resolvent, &c. according to the Symptoms.

When the Joint is perceived to be distended, and the Ecchymosis to spread, the Surgeon, to save the Patient from Lameness, or to prevent an Ankylosis of the Joint, handles the injured Part very gently, and tries to move the Fore-Arm slightly; and, as soon as he perceives the Patient to be out of Danger, and no Symptom to be feared, he brings the Parts near by a circular Bandage; he puts the Fore-Arm in a Sling, and orders the Patient to move the Joint by little and little, to divide the Synovia; and provided there be a Fracture, to prevent the ossific Juices from cementing the Parts together.

The Blood frequently extravasates in the Bodies and Interstices of the Muscles, which may occasion a Collection of Matter, that does not show itself 'till more than six Weeks afterwards. It must be discharged to prevent a Gangrene. Sometimes this Blood by it's Thinness transpires, and extravasates in the Texture of the Skin; in this Case camphorated Brandy, sharpened with Sal. Ammoniac is made use of.

II. Of the Luxation of the Radius.

I WILL not describe this Luxation, till I have given the Opinion of several Authors who have treated of the Diseases of the Bones. I am going to relate what each in particular has said.

Ambrose Paré, speaking of the different Species of Luxations of the Cubitus, says, in one Place, that when the Ulna has intirely quitted it's Place, the Radius is likewise dislocated. He forewarns the Surgeon in the Reduction of the Ulna, to be

careful in replacing the Radius. He remarks, that there is a round concave Process at the superior Part of the Radius, that receives the Humerus, and a little Process to which the Biceps is attached.

There is Reason to suppose, that Ambrose Paré never knew the particular Luxation of the Radius, since he says, not to impose on the Readers, that in the Reduction of the Ulna, the Radius must be reduced. It is evident, that this celebrated Author never knew, nor reduced the Luxation of the Ulna, because he acquiesces to the Opinion of his Predecessors. Nevertheless, to show the Doubt he appears to be in, he observes, and insists, without explaining himself more clearly, that there is a particular Articulation of the Radius with the Humerus, and a Process in that Bone for the Insertion of the Biceps.

Guillemeau, treating of the Species of Luxations, contents himself with saying: *Some add a Species of Luxation, called by the Greeks Diastasis, which is, when the Bones naturally contiguous, are removed, and separated from one another, as the Tibia with the Fibula, the Radius with the Cubitus.*

Courtin only says, that the Radius may be separated from the Ulna by the Relaxation of the Ligaments, and that it cannot be replaced.

Daleschamps, in one of his Observations, says, that it will be thought strange, he does not speak of the Luxation of the Radius; but the Reason is, it seldom happens, unless the Cubitus is dislocated at the same Time.

Fournier, treating of the Luxation of the Cubitus and Radius, after having mentioned how these Bones are articulated with the Humerus, says, that this Luxation is to be considered three Ways. These are his own Words: *Where both Bones, namely, the Radius and Ulna, are dislocated together, or separately, but the Luxation of the last, whether alone or otherwise, is the worst.*

He goes on to say, Page 250, that *the Dislocation of the Radius has nothing particular*; and thus he explains himself: *But if the Radius is dislocated, it has nothing particular, except that it follows the Cubitus. It borrows the same Signs, and if it is luxated alone, it's Separation from the Cubitus may be discovered by the Touch; and besides this, it's Process is seen above, if it is luxated externally, or forwards; if forwards, or backwards; if it is backwards, and the Cavities on the opposite Side; whereof it is necessary to observe, that this Bone cannot be luxated below, on Account of the Cubitus that supports it.*

How does the incompleat Luxation happen?

The

The incomplete *Luxation*, or *Elongation*, is owing to the *Relaxation* of the *Ligaments*, that are soaked in *Moisture*, and by a violent *Extension*, particularly in young and delicate Subjects, as *Children*, which is generally cured, or at least easily replaced.

It appears by this Passage, that he knew something of the *Luxation* of the *Radius*.

He says in another Place, Page 251, *When the Radius alone is luxated, it is chiefly externally, and in this Case it is easily replaced by a proper Extension.*

He adds, Page 253, *And if the Radius is luxated alone, it will be easily replaced by applying the Palms of the Hands upon the Eminences, and pushing the Bone in it's Place, and by making a Compression on every Side.* He likewise says, that if any Difficulties are met with, Recourse must be had to *Machines*, &c.

This Author comes nearest to the Knowledge of the *Luxation* of the *Radius*, and even by what he says of it, we ought to believe, it has occur'd in his own Practice; but we will give the Signs more plainly, whereby to distinguish it properly, and the Means of Reduction.

Verduc, Surgeon, in his Treatise of Bandages, makes no mention of the *Luxation* of the *Radius*.

Verduc, Physician, in his Pathology, Page 561, says, that the *Cubitus* cannot be luxated, unless the *Radius* quits the *Protuberance* of the *Humerus*; for which Reason, in reducing the *Cubitus*, we are to observe, whether the *Radius* is in it's Place, which will be known by the Freedom of performing *Pronation* and *Supination*.

De Gouey, Surgeon, in his Book intitled, the true Surgery, expresses himself thus, Page 154, *The Cubitus cannot be luxated forwards, unless the Olecranon be fractured, and consequently, except the Patient be absolutely lamed thereby. It cannot be thrown backwards in a compleat Luxation, unless the Ligaments are greatly lacerated, and the Radius dragged along with it; and lastly, unless both Bones are separated, which is still a very terrible Disease.* He says, Page 155, *If the Radius was luxated with the Cubitus, the Dislocation would be composed of two or three Species of Luxations; because the Radius may be dislocated from the Humerus, wherewith it makes an Arthrodia, and from the Cubitus, with which it is joined by an immoveable Articulation, which I have called Syneuro-dartro-Synarthodial.*

Let us now explain in what Manner the *Luxation* of the *Radius* is effected, and wherein it differs from those, that Authors have described.

First, It is necessary to recollect, that the *Radius* has four Articulations, two common to it, the one by a small *Enarthrosis*

throsis at it's superior Part with the Protuberance at the external Condyle of the Humerus, the other by a large Enarthrosis at its inferior Part with the first Row of carpal Bones: Secondly, That the Motions of Pronation and Supination are solely effected by other two Articulations, that are proper to it, and are executed upon the Cubitus, that supports it; that these Motions from within outwards, and from without inwards, are classed with the third Species of Ginglymus: Thirdly, That the Radius is small at it's upper, and very large at it's lower Part, and that the contrary is observable in the Ulna: Fourthly, That the superior Part of the Radius is covered with many Muscles, and consequently, that it cannot separate from the Cubitus, as has been believed, because the Ligaments oppose it. Indeed a compound Fracture may overcome all these Obstacles.

The Luxation of the Radius I propose, generally happens by a greater or less Extension, or by a Fall.

For Instance, when a Child is taken hold of by the Wrist to make it leap over a Kennel, or to remove it from one Place to another, the whole Shock passes along the Radius by the Compression on the Cubitus, by the Hands of him who holds the Child's Wrist, and by the Weight of it's Body, that resists the Effort, when lifted up into the Air. In such a Case, the Fore-Arm should be fractured, or luxated; but the Cubitus and Humerus make on that Occasion, as it were, but one Piece. Then the Pressure that is made upon the Cubitus by the inferior Part of the Radius, which is large, obliges it's upper Part, which is small, to quit the Capsula, that articulates it with the Protuberance of the Humerus, and this is the true Luxation of the Radius, which consists in it's being removed two or three Lines from the Humerus lengthwise. It is not then carried outwards, inwards, nor in any other Direction, as has been pretended. Besides, the circular Ligament, that embraces the Neck of the Radius, the interosseous Ligament, and Insertion of the Biceps oppose it.

This Luxation generally causes but slight Pain at the Instant it is made by Extension. The Fore-Arm and Hand remain in perfect Pronation, as they cannot be moved by the supinator Muscles. But, if we would move the Arm by extending it, the Child is in very acute Pain at the Bend of the Arm. Thus the true Sign of the Luxation of the Radius is, that Supination cannot be performed. I have seen many such Luxations reduced in Children. It is more uncommon in Adults by Extension. I will nevertheless give Examples of it.

As

As for Falls, they may occasion it, as I have seen, and I have remarked that the upper external Part of the Fore-Arm becomes more or less swelled, especially when the Disease has been neglected, or unknown. I even imagine, that the Loss of the Motion of the Fore-Arm has occasioned a Belief, that the Cubitus was luxated, and for that Reason, as I suppose, Authors have proposed to place the Bend of the Arm round a Bed-Post, and by the Extension made in pulling the Fore-Arm to effect the Reduction.

This Luxation may occasion Symptoms, which are known too late to be remedied. They are owing to the Compression of the Vessels, especially the Veins, and Lymphatis, to the Tension of the Biceps, which is occasioned by the perfect Pronation of the Fore-Arm and Hand; and lastly, to the Lodgment of the Synovia, which produces an Abscess, that commonly changes into a Scrofula; as I have seen happen to a Woman about thirty Years of Age, where the Luxation of the Radius was not known, and whose Joint I opened after Death.

The Prognostic to be made of the Luxation of the Radius is, that the Patient may be cured at the Beginning of the Disease, but if it is old, he will remain lame.

The Reduction of the Radius is quite different from that of other Luxations, because these can only be reduced by Extensions, Counter-Extensions, by the Application of Ligatures; and lastly, Recourse is had to Machines; and these are the Means that all Authors have advised for the Reduction of the Radius.

But if this Species of Luxation is attended to, it will be apparent, that all these Means are useless, and even hurtful to the Patient. First, the Radius is no longer united with the Humerus, for it is removed some Lines from it, as before-mentioned; Secondly, the Fore-Arm and Hand remain in Pronation, and immovable; Thirdly, the Radius has no other Support than the Ulna, and is surrounded with many Muscles: Thus the different Motions, that might be made to the Fore-Arm, will only act upon the Ulna, and without Success; the Patient will be even exposed to Tortures, that will cause intolerable Pains, and an enormous Swelling of the Joint.

To spare the Patient these Symptoms, and procure him the Use of the Part, the Surgeon seats him upon a Chair; he orders the Arm to be held naked. Then he places his Right-Thumb in the Bend of the Arm, near the Insertion of the Biceps; he embraces the Olecranon with the other four Fingers. The Surgeon takes hold of the Patient's Wrist with his

Left-Hand, wherewith he turns the Radius; and Hand outwards, viz. he puts them into perfect Supination. During this Motion, he pushes the Radius, or rather secures it with his Left-Thumb. When he thinks the Supination sufficient, he bends the Fore-Arm, inclining it more outwards than inwards. Then the Cavity of the Radius re-enters into the Capsula, and receives the Protuberance of the Humerus. The same Operation is to be performed in the Luxation of the Radius of the Left-Arm; but if the Luxation is on the right Side, the Surgeon must apply his Left-Thumb in the Bend of the Fore-Arm, and perform it, as before-mentioned.

The Bandage consists in a circular Compress, and two long Compresses placed like a St. Andrew's Cross, one circular above, and the Bandage as in Bleeding. The Arm must be laid in a Sling for two or three Days. Care is always to be had, that the Arm be in Supination. I have never used any Thing else, especially to Children, &c.

My Knowledge of this Luxation was merely owing to the great Number of Children I have been consulted about. I ingenuously own, that at first I considered it as a Luxation of both Bones, as well upon Account of the Swelling I met with in some, as by Reason of the Difficulty of moving the Fore-Arm. But, perceiving that Extensions were useless, I resolved to try the Motion of Supination, and I succeeded. However satisfied I was of the Success of this Practice, I did not propose this Luxation in publick, and to some Practitioners, but with Doubt, as I had not had an Opportunity of being assured of it in the Adult. I was, nevertheless, certain of what I had advanced, by opening the Patient's Arm before-mentioned; and since that, Chance has procured me some Examples, which I will now give.

OBSERVATION I.

I Was sent for to Beau Regard-street, near Bonne Nouvelle, to see Mr. Gaudin, Brandy-Distiller, upwards of sixty Years of Age; he had been in great Pain above fifteen Days, as he told me, from a Fall he had had upon his Left-Arm, and that all the Topics that had been applied, no Ways relieved him. The Situation of his Hand and Fore-Arm in Pronation, strengthened me in my Opinion of the Luxation of the Radius. I tried to make him bend the Part, and perform Supination; but the Pain was intolerable. I instantly informed him of his Disease, and that the most certain Method was to reduce the displaced Bone, otherwise he would remain lame; and that on Account of his Age, an Abscess might happen to him

him by the Stagnation of the Fluids, which would have been the Case, since the whole Fore-Arm and Hand began to be ædematous. He took my Word, I had him held fast, and the Reduction was, with great Difficulty, effected. The Bone being reduced into its Place, I made him perform the Motions of Pronation, and Supination, and lay his Hand upon his Head. The whole being finished, I laid the Arm quiet for some Days, the Ædema disappeared, he was free from Pain, and used his Fore-Arm as before.

OBSERVATION II.

SOON after an Irish Priest, a Vicar eight Leagues from Paris, was thrown from his Horse. He had the same Fate with Mr. Gaudin. He remained above three Weeks unable to move the Right-Arm. He was advised to come to Paris to be treated. As a Student of his Family knew me particularly, he came to me. The Reduction was performed before several People, and the Patient returned entirely satisfied.

To these two Observations, Falls gave Occasion; and as I have said, that the Luxation of the Radius was very common to Children by Extensions, the following will show, that although the Joint of the Elbow be closer, and more strengthened by Ligaments, and Muscles in Adults, it may as well happen in them. Indeed it is much more rare; however, we ought to infer from this Case, that the above-described Signs are to be attended to, to prevent Deception.

OBSERVATION III.

THE Mistress of the School at Newilly upon Seine, a League from Paris, had the Radius of her right Arm luxated by an Extension, which was done by a Person that forcibly seized her Wrist. The Surgeon of the Place, ignorant of the Disease, as were several others whom she had consulted, the Fore-Arm and Hand remained in Pronation. A very hard large Tumor appeared towards the upper external Part of the Radius. It gave her very acute Pains, and prevented her from sleeping. After four Months she was sent to me. I thought the Disease would be incurable; for having attempted the Reduction, the Patient fell into a Syncope. I advised Embrocations to relax and dissolve the Humor, and a resolvent Plaister, which she used for some Time, after which she came to Paris, where she staid near six Weeks. As the Tumor was somewhat dispersed, I tried from Time to Time to replace the Radius. Being yet unable to succeed, I ordered the Fore-Arm to be put three Times a Day into a Fish-Pan of emollient Herbs; after which
the

the Decoction was poured upon the injured Part. This allowed me to bring back the Hand and Fore-Arm gradually outwards. The Pains still subsisting, notwithstanding all these Topics, to calm them. I ordered Fol. Verbasci alb. — Solani, — Hyosciam. incis. to be boiled in Ol. Lin. With this the Part was embrocated, and covered with blotting Paper, and the whole kept on by Compresses. This Treatment eased the Patient, and assisted in restoring the Fore-Arm and Hand so that she could continue to write, which she never would have done without these Helps. It is proper to observe, that a Swelling always remains at that Place, but she uses it with Freedom enough.

III. *Of the Luxation of the Wrist.*

THE Articulation of the Wrist is composed of the Junction of the Extremities of the Ulna, but chiefly of the Radius, with the first Row of carpal Bones, or the Beginning of the Wrist.

This Articulation is a large Enarthrosis, whose Motions are performed in all Directions. The three first Bones of the Carpus by their Conjunction form a convex Head resembling a Crescent, which is smooth and polished by the Cartilages that cover it. It is likewise received in a very smooth Cavity at the lower Part of the Radius. The Ulna has no Share in it. This Cavity is surrounded with a very free ligamentous Capsula.

Besides which, there is an external and internal Ligament; and it is also strengthened laterally by two Processes, called Styloid, on Account of their Figure, and by the ligamentous Bands that go off from these Processes, to the first Row of carpal Bones. If the two transverse Ligaments, improperly called annular Ligaments, are added to all these Bands, and all the Tendons passing under them are included, it will be easy to judge, that all these Parts must form so many Obstacles, that oppose the Dislocation of the Wrist, especially when they are in Tension.

It is easy to judge by the Conformation of this Joint, that it may be more easily luxated inwards, and outwards, than laterally, where it is strengthened both by the styloid Processes, and ligamentous Bands above-mentioned.

The Luxation inwards and outwards is always compleat; but in the lateral one, it is always incompleat.

If the Wrist is dislocated inwards, the Hand is turned back; and, if outwards, it is bent; if the Luxation is on the Side towards the Thumb, the Hand and Wrist are turned towards

towards the little Finger; and vice versa. These two Species of Luxations seem impossible; and, if they happen on either Side, the Ligaments of that Side must be lacerated, and the Process fractured, to say nothing of the Injuries done to the neighbouring Tendons.

The Signs that inform us of the Luxation of the Wrist inwards are obvious, since the Patient's Hand and Wrist are turned back, and thrown outwards. An Eminence appears inwards, or anteriorly, which cannot be sensibly perceived on Account of the Tendons of the Sublimis and Profundus that are in a Mass, which are greatly extended, and forced forwards; a Depression more or less distinct is seen at the external Part of the Wrist.

The Signs of the Luxation of the Wrist outwards are contrary to the above; for the Hand and Fingers are bent, and the Wrist is thrown outwards, or backwards, with an Eminence more apparent than in the first Species, because the Back of the Hand is not provided with so many Tendons. The Depression inwards is scarce perceptible, by Reason of the Bulk of the fore-mentioned Tendons; a transverse Fold is only to be seen.

If the Signs of the supposed lateral Luxations, either towards the Thumb, or little Finger, are considered, we ought in good Practice to look upon them at least as doubtful, having already shown them to be impossible. It may nevertheless happen, that in falling upon either Side of the Wrist, the Extension that the Tendons and Ligaments shall have suffered, may oblige the opposite Muscles to contract, and thereby keep the diseased Side in it's forced State, and inactive. Every sprained Muscle is known to lose it's Action for a Time, and it cannot recover it but by Embrocations, and other proper Topics, and an easy Situation; and as the whole Circumference of the Wrist is every where provided with Tendons, each of which answers to a fibrous and fleshy Belly, whose Action is to move a Part separately, or several together, it is not surprising that they communicate to one another the Pain produced by a Fall, Blow, or Contortion. It is likewise necessary to remark, that all the Muscles have particular Sheaths, that are continued along the Tendons, and that besides which, the Muscles of the Fore Arm are surrounded with a common Aponeurosis that contains, and confines them; but in the Case I speak of, it is in such Tension, that all the Muscles are so compressed as to obstruct the Circulation there, and the Patient cannot move his Hand, or perform Pronation and Supination, unless he ex-

poses himself to acute Pains. The same Thing happens to him, if any one touches him, &c.

Let us suppose, for Instance, that he has fallen, and that the whole Shock is spent upon the Surface of the Thumb and Fore-Finger; the Tendons of the Extensors of the Thumb, the Supinator longus, both Tendons of the Radialis externus, will be so elongated by this forced Extension, that the Hand will be thrown towards the little Finger. Then the Cubitalis externus and internus contract, and keep the Hand in that Situation, until the Muscles have recovered their lost Spring, the Pain is continued all along the Fore-Arm, and is communicated to the Aponeurosis of the Biceps, and from thence passes to the Arm, and vice versa.

Though in these Sorts of Falls, the Flexors and Extensors may appear in some Sort not to suffer, nevertheless it is apparent that they are hurt, and compressed by their surrounding Sheaths, on Account of their Connexion with the above-mentioned, which prevents the Patient from moving his Fingers, except with great Difficulty, though they be neither too much bent, nor extended.

It is necessary to remark, that the Situation the Hand is met with in these pretended lateral Luxations, may very frequently impose on those not versed in the Practice. This I am going to show, by what passes in the Wrist. When the Hand is turned inwards towards the Thumb, an Eminence is felt, or seen, which is taken for the displaced Head of the first Row of the Carpus; but it is a Deception, it is only the inferior Extremity of the Ulna, which is very prominent, and apparent in some, especially thin People. The same may be said of the pretended Luxation towards the little Finger. Thus in such a Case we must not make Extensions and Counter-Extensions, as is commonly directed; we need only to relax, distend, and soften the injured Tendons and Ligaments, and by this Means the Hand and Wrist will be gradually brought back into their natural Situation. We have shown, in speaking of the particular Luxation of the Radius, that the Hand remains in perfect Pronation; and as that Luxation has not been properly distinguished, it may have given Occasion to the Error.

The Causes of the Species of Luxations inwards and outwards, are Blows, but chiefly Falls. Violent Extensions contribute greatly thereto. As to lateral Luxations they are very rare, but if they happen, they are accompanied with terrible Symptoms.

The Prognostic that may be made of the two first Species of Luxations is not bad, when they are recent, for they are easy
to

to be reduced; but if the Patient is not quickly relieved, and should neglect to be treated, a Crowd of Symptoms quickly ensue, such as the Swelling of the whole Hand, and Fore-Arm, the Articulation is filled up with Synovia; all the Sheaths of the Tendons of the Sublimis and Profundus, which are closely connected together, are choked up, which Distention is continued along the Fingers, and renders them stiff and inflexible, the adipous Membrane becomes cedematous by the Lodgment of the Lymph; lastly, if it is not remedied by applying proper Topics to facilitate the Reduction, the Symptoms increase to such a Degree, that the Inflammation seizes upon the Skin, which undoubtedly tends to an Abscess, or Collection of Matter, that is, of the Erisipelato-Phlegmonous Kind, and which, for want of being opened, at last causes sinuses very difficult to be distinguished, which insensibly lead on to a Mortification and Gangrene. Therefore ought the Surgeon to use all his Care to find out these Abscesses, and as soon as he has discovered the Seat of the Matter to give it vent, and sufficiently set free the Aponeuroses, avoiding nevertheless the Arteries which run in these Places.

If notwithstanding this Treatment the Part does not relax, but remains immoveable, and in the same State, the Ankylosis is to be feared. The Matter may also by it's Stay become corrosive, and render the Radius and Ulna carious, and at the same Time the small carpal Bones. Then the Disease is incurable, if Recourse is not had to Amputation.

Such like Symptoms are frequently not attended to, as the Mass of Blood of a Number of those to whom they happen, is infected with a venereal Virus, or is impoverished by other Excesses, which should be known early, as these Indications instruct the Surgeon; whereas these bad Dispositions being known too late, these Symptoms cannot be remedied, which is owing to the then melancholy State of the Patient.

The Prognostic of the pretended Luxations inwards and outwards, that is, towards the Thumb and little Finger; as they are never compleat, unless there be a Fracture, and Dilaceration of the Ligaments, is very bad, and there is Reason to fear, that the Patient will be lame, and suffer a long Time. If the Wrist by a Fall is thrown to either Side, and the Ligaments and Tendons are elongated, the whole Treatment consists in taking the proper Measures to calm the Symptoms, prevent the Inflammation, and Tension of the Part, and place the Fore-Arm and Hand commodiously.

The Means employed for the Reduction of the Luxation of the Wrist, either inwards, or outwards, are of two Sorts.

First, Extensions and Counter-Extensions are begun with, they must be stronger or weaker, according to the Situation of the Wrist, and the Place it occupies. If the Luxation is inwards, the Fore-Arm is placed horizontally, so as to be neither in Pronation, nor Supination. An Assistant takes hold of it a little above the Wrist, which he keeps firm; another must grasp the Back of the Hand as hard as he can, and make the Extension. The first resists the Motion of the other, which makes the Counter-Extension. As soon as the Surgeon perceives the Wrist to be removed from the Fore-Arm, he pushes the Head from inwards-outwards with his Hand. At the same Time, the Assistant destined to the Extension pulls the Hand from outwards inwards, depressing it. This is what is practised for this Species of Luxation.

If the Luxation is outwards, the Assistants make the Extension and Counter-Extension, observing the same Method as above; and, as the Head of the first Row of carpal Bones is thrown outwards, and the Fingers are bent, as soon as the Extension is sufficient, the Surgeon pushes the displaced Pieces from outwards inwards, and the Assistant raises the Hand and Fingers from inwards outwards, whereby the Head re-enters into it's Place.

Many Practitioners have employed the following Means. When the Extension, and Counter-Extension are thought sufficient, the Hand is placed upon a Table. If the Head forms a Tumor inwards, the Hand is laid in perfect Supination, and the Surgeon with the Palm of his Hand presses upon the Eminence, whilst the Assistants pull on every Side to facilitate the Entrance of the Bones into the Cavity of the Radius. He who makes the Extension cannot do it in this Case, but by pulling the Fingers. If the Head is outwards, the Hand is to be laid upon the Table in perfect Pronation; the Extension and Counter-Extension are to be continued, the Surgeon must lay the Palm of his Hand upon the Eminence, and push from outwards inwards, and the Assistant must raise the Hand from inwards outwards.

It would be needless to propose Means for the supposed lateral Luxations, as I have shown they cannot happen, without being exposed to Accidents that require a particular Treatment.

Besides the Luxations of the Wrist, there are others that particularly concern the small Bones that compose it. They are

are eight in Number, disposed in two Rows, and articulated with one another by Heads and Cavities; and, though their Articulations be very close, they nevertheless quit their natural Place by violent Blows, or Falls, being forced outwards or inwards. It is easily known by the Tumor, which the little luxated Bone forms where it is thrown.

As to the metacarpal Bones, if the Firmness of their Conjunction is well considered, it is easy to judge that their Luxation is very difficult at their Junction with the last Row of the Carpus, and if it happens, it can only be the displacing of the little carpal Bones, and this Disorder ought to be considered not as a Dislocation, but as a true Diastasis.

The Apparatus for all these Species of Luxations of the Wrist consists, first, in placing a moderately thick Compress, four or five Fingers breadth long, in the internal Part of the Arm. It must extend from the Middle of the Fore Arm to the Palm of the Hand; secondly, another Compress of the same Length and Breadth is to be applied externally; thirdly, they must both be kept on by a simple Compress, slit at it's Extremities, which are to be turned upon the Wrist. These Compresses must be wet in a common Defensive; lastly, we take a Band about three Ells long. We begin with three or four Circulars round the Wrist; then we place a Compress like a Cushion in the Palm of the Hand, which we sustain by the Band that is passed betwixt the Thumb, and Fore-Finger. After we have made several Circulars both in the Palm and Back of the Hand, we continue it upon the Wrist, and finish it at the Middle of the Fore-Arm. When the Patient is calm and free from Pain, we lay the Hand and Fore-Arm in a Sling 'till they are perfectly cured. We must not forget to bleed the Patient several Times, if he is strong and robust, to prevent the Symptoms which the Tendons and Ligaments are subject to, &c. Some place upon the longitudinal Compress, that extends into the Palm of the Hand, a Paste-Board Splint, in Form of a Battle-door, wet in the Defensive, or in Water, that it may mould itself upon the Part. It is secured by the Band, and it serves to keep the Wrist extended.

IV. *Of the Luxation of the Fingers in general, and of the Thumb in particular.*

I. *Of the Luxation of the Fingers.*

EACH Finger is known to be composed of three Pieces; the first is articulated by a small Enarthrosis, with the metacarpal

metacarpal Bones; the second and third by the first Species of Ginglymus.

The articular Ligament of the first Piece, or Phalanx, is circular in Form of a Capsula; nevertheless, there are lateral Ligaments, and the two last Phalanges are secured laterally by very strong Ligaments like a Ginglymus.

The first Phalanx being articulated by a small Enarthrosis, may luxate in all Directions, and even slide upon the metacarpal Bones. The fore and little Finger are the most exposed to it; because they are more at liberty and less constrained, than the middle and ring Finger.

When this Species of Luxation happens, the lateral Ligaments must be ruptured, or elongated to allow the Cavity of this Phalanx to quit the Head of the metacarpal Bone, especially when it is removed from it's ordinary Situation.

As for the Luxation of the Thumb, we will speak of it in particular.

The second and third Phalanges are articulated by a Ginglymus of the first Species. Their Articulations are very strong on Account of their Smallness; nevertheless, they may luxate lengthwise, and then the Phalanges slide upon one another, above or below, but seldom laterally. In such a Case, the lateral Ligaments must be ruptured, or else one Condyle only is luxated, the other remaining half turned. This Species of Luxation is rather imaginary than real; and if the End of one Finger changes it's natural Situation, it can only be occasioned by the Extension of some Ligaments and Tendons.

The Luxations where the Fingers slide upon one another are very rare, and difficult to be reduced, not to say impossible, especially when those Bones have remained some Time unreduced. Indeed, let what Force soever be employed, we cannot succeed. Several very able Surgeons have certified, that they have seen such Luxations, and that they could never reduce them, notwithstanding the most forcible Extensions.

Three Obstacles may contribute thereto; first, there is not sufficient Hold to make the necessary Extensions; secondly, the most considerable is, that in applying the Ligature very near the first Phalanx, the Tendons of the Muscles are included therein, and consequently the Ligature itself becomes an Impediment to the Reduction; thirdly, the Tendons of the Flexors and Extensors are swelled to such a Degree, that they do not yield but with great Difficulty; lastly, when the Reduction is effected, they do not keep reduced, because the Spring of the Tendons dislocates them afresh. The Insertion

of

of the Flexors is very singular, particularly those of the Sublimis *, which alone are sufficient to cause the Luxation.

The Causes of the Luxation are Falls, violent Extensions, the Contortion of a Finger held, and as it were, wedged in betwixt two Pieces of Wood, Stone, &c. Blows may likewise contribute thereto.

The Signs of these Species of Luxations are similar to such as distinguish those, that happen on every Side; that is, those of the Bones articulated by Enarthrosis. As to the Ginglymoids, a Difference ought to be made. Indeed those of the large Bones thus articulated are very rare, not to say impossible; but as to the Fingers, the Eminencies and Cavities are superficial; their Surfaces are small, and consequently they may be reversed, or very much bent, by an Effort, and occasion a Luxation of the Joint. Though they be rare, I have had an Opportunity of seeing the two last reduced, without any Accidents.

The Prognostic to be made of such Luxations depends upon the Species, the Time they happened, and their attending Symptoms. That of the Luxation of Pieces articulated by Enarthrosis, will always be less terrible than that of ginglymoid Joints.

When the Pieces are reduced, they must be kept so by small Splints, and little long Compresses, especially in the Luxations of the two last Phalanges. If what is taken for a Luxation is, as it may be, only a forced Extension both of the Tendons, and Ligaments, this Apparatus is equally proper towards their Recovery.

As to the Apparatus for the Luxation of the first Phalanges, it must be different in each Luxation. It is always a Head forced out of it's Cavity. The Fingers are to be slightly bent. The Palm of the Hand must be filled with a square Compress; small slit circular Compresses are applied upon the luxated Joint, and the whole is kept on by a Band, wherewith a circular or two is made round the Wrist; then it is passed into the Palm of the Hand upon the Compress, in order afterwards to make several Turns both in the Palm and Back of the Hand, and it is fastened where it ends.

* Vid. Winslow, in his Treatise of Anatomy, gives a most excellent Description of the Insertion of those Tendons.

II. *Of the Luxation of the Thumb.*

THE Thumb ought to be considered as the chief of the Fingers. Indeed it is it that secures, and gives them Firmness in Action, and serves to protect them. A Person whose Hand is deprived of the Thumb has lost many Advantages. It is true, the Thumb is shorter than the Fingers, but in Recompence it is thicker, and more capable of moving in all Directions without the Aid of the other Fingers, which is not proper to them, as they cannot act without the others contributing somewhat thereto. We except, nevertheless, the fore and little Finger, which have particular Muscles. It must, notwithstanding, be allowed, that there are People, who move their Fingers separately in Consequence of a long Habit, such, for Instance, as is contracted by playing upon Instruments.

The Thumb like the other Fingers is composed of three Phalanges. The Body of the first is convex externally, flat in its whole Extent, slightly concave internally; its Structure is very little different from that of the metacarpal Bones. Finally, our chief Business here is to observe, that the Cavity destined to its Articulation with the carpal Bone of the second Row is almost superficial and triangular, which gives the Thumb the Freedom of moving in all Directions. This Articulation is classed amongst the large Enarthroses. It is articulated with the second Phalanx, by a little Head received into its Cavity by a small Enarthrosis.

This Description shows, that the Thumb may be dislocated at either Extremity, which Experience but too often proves; for it is more frequently seen luxated than the other Fingers, &c. Moreover, what exposes the Thumb to more frequent Luxation, besides the Freedom of its Articulation, is, its not being placed perpendicularly like the metacarpal Bones; it is a little inclined inwards. This Mobility which is proper to it is the Reason, why in Falls, Blows, and Extensions, it, as it were, presents itself the first; but this Inconvenience to it serves to protect the other Fingers.

The Luxation of the first Phalanx of the Thumb from the Articulation of the carpal Bone of the second Row, is very difficult to be reduced, when inwards, and outwards, but it is more easy, for many Reasons, when it happens in the Way of Flexion and Extension; first, the Articulation, though of the large Kind of Enarthrosis, is only made by the Reception of a Head in a Cavity, as in the others; secondly, the upper Part of this Phalanx is very much inclined towards the metacarpal Bone,

Bone, that sustains the Fore-Finger, which serves it as a Supporter; thirdly, the first Phalanx of the Thumb is shorter, and thicker than the metacarpal Bones. It is moreover surrounded on all Sides by very thick fleshy Masses, except on it's upper Part, where it's extensor Tendons are placed; thus in Falls or Blows, the Shock is deadened by the Resistance of these Muscles, and metacarpal Bones, before it reaches it's Articulation, which renders it's Luxation outwards and inwards, almost impossible. If it happens in the two last Cases, viz. in the Way of Flexion, or Extension, terrible Symptoms must necessarily ensue, such as the Dilaceration of the Thenar, Antithenar, and other Muscles. The flexor Tendons of the Thumb must be elongated, when the Luxation is in the Way of Flexion, on Account of the Phalanges being reversed towards the Wrist. If the Luxation is outwards, the Thumb must be greatly bent, the superior Part of the first Phalanx projects outwards, which cannot happen without a Rupture of the Capsula, and a considerable Elongation of it's extensor Muscles and Tendons.

I will add, that Cases are met with where by the foresaid Causes, this Articulation becomes swelled, and in Tension, with Loss of Motion, and excessive Pain. These Symptoms may impose on those who have little Knowledge of Luxations. In such a Case, these Symptoms are only to be remedied by gentle Means, and the Patient is not to be exposed to Extensions, and Counter-Extensions, which would be useless, and even hurtful to him.

In respect to the Articulation of the superior Extremity of the first Phalanx with the inferior Part of the second, I have said that it moves in all Directions, and that it is amongst the small Enarthroses.

This Part is easily and frequently luxated, for the following Reasons. First, it is articulated by the Reception of a little Head in a superficial Cavity; it's Capsula is very thin; it's lateral Ligaments are very loose, and it's Motions very free. Secondly, the Articulation is more uncovered than that of the first, especially externally. Thirdly, it's Sides are but little strengthened by the Thenar, and Antithenar, which terminate at the superior Part of the second Phalanx.

As for those that are supposed to happen laterally, I as well as many Practitioners have never seen them.

The Force must be imagined very great in the Luxation in the Way of Flexion; for that the second Phalanx may be forced out of it's Place, the Resistance of the sesamoid Bones are to be overcome; nevertheless, it happens, as has been said.

The distinguishing Sign is the Turning back of the two last Phalanges outwards, and the Projection of the extensor Tendons.

The Luxation in the Way of Extension is more frequent; for, when we fall, the Thumb being bent, the Shock along the Phalanges forces the Head out of it's Cavity, the Capsula being very thin, and the Tendons and Ligaments opposing it but weakly. Then the Extremity of the Thumb is greatly bent, and the upper Part of the second Phalanx is forced outwards, where it forms an Eminence.

The Prognostic of these two Species of Luxations is not of the most terrible Kind. If they are recent, they may be reduced by the Extensions, and Counter-Extensions the Surgeon himself makes. If they have been neglected, whether by the Patient or Surgeon's Fault, the luxated Part becomes swelled and painful; which obliges us to embrocate, and apply emollient and resolvent Cataplasms. The Symptoms being calmed, the Reduction is set about, but we do not always succeed.

The last Phalanx of the Thumb is very frequently luxated, because it's Surface is greater than the last Phalanges of the other Fingers. It is most commonly on the Side of Flexion, viz. the last Phalanx is turned back.

I have seen many such Luxations, where the Patients have been lamed, by having confided in People ignorant of these Diseases, and where an Ankylosis has seized upon the Articulations, &c.

The Reduction of the first Phalanx with the Carpus, if it be at all possible, must be very difficult on Account of the fore-mentioned attending Symptoms. It is not the same with the Luxation of the other Extremity of this Phalanx with the inferior Part of the second. It is obvious to the Sight and Touch, consequently it is not difficult to be reduced, as the Extension can be easily made.

The Bones being replaced, the Joint must be bound by a circular Compress, wet in a Defensive, and slit at one Extremity. It is to be proportioned to the Size of the Part. Then we apply Compresses to cover both the Palm and Back of the Hand. They should likewise be dipt in the Defensive, and secured by a Band with which two Circulars are made round the Wrist. After which it is passed over the Luxation betwixt the Thumb and Fore-Finger, it is brought to cross upon the Luxation in Form of an X; the Band is continued over the Back of the Wrist, to enter into the Palm of the Hand; and it is passed betwixt the Thumb and Fore-Finger, crossing upon the Luxation, and is thus continued to it's End; it is a

Species

Species of Spica. The Patient must bear his Hand in a Sling, or Handkerchief fastened to a Button Hole of his Coat; observing that it be a little raised to favour the Return of the Blood.

ARTICLE III.

*Of the Luxation of the inferior Extremities.*I. *Of the Luxation of the Thigh.*

WHEN we consider that the Acetabulum wherein the Head of the Femur lodges is deep; that the Muscles which move it are stronger than in any other Part; and that it's Articulation is the largest Enarthrosis of the whole Body; it is easy to judge that a very great Force is required to luxate the Thigh.

The Acetabulum is very deep at it's superior and posterior Part, and much less at it's inferior and external Side. A very large Notch is observable at the internal Part of this Cavity; which is closed above by a cartilaginous Ligament, and a simple Membrane through the remaining Part of it's Extent. At the external Side of this Notch is a Fissure, through which the Vessels pass, that go to the Glands and Ligament within this Cavity. This Notch is on the same Side with the Foramen ovale. It's Entrance forms a Depression which extends to the Center of the Cavity, and occupies above a third of it.

This Depression is not covered with a Cartilage, but only with a Membrane, and glandular Network, which furnishes the Mucilage that lubricates all the Joint. The Remainder of the Cavity is incrusted with a very thick Cartilage, which likewise deepens the Depression more.

Besides the above-described Notch, two Depressions are observable in the Circumference of this Cavity, the one above, that is covered with a Cartilage upon which the Tendon formed by the Psoas and Iliacus Muscles slides, the other at the Middle of the posterior Part, which serves to lodge the Neck of the Femur, when the Thigh is thrown outwards.

The Acetabulum is proportioned to the Size of the Head of the Femur. All this Joint is surrounded by a Ligament of a very compact Texture. It rises from the whole Circumference of the Cavity, and covers the cartilaginous Brim, and is strengthened by the Tendon of the Rectus Cruris, and after it has surrounded the Joint, and even the Neck of the Femur, it goes to be inserted quite round the Beginning of this Neck.

This Ligament keeps the Head of the Femur in the Acetabulum, and contains the Synovia, that lubricates this Joint. There is another Ligament, that is hid within the Cavity. It is flat, and attached by one Extremity to the Ligament that forms the Notch of the Cavity, and to it's neighbouring Parts, and is inserted by the other into a little Pit in the Head of the Femur, about two Thirds below it's Center. It is to be remarked, that it does not occupy all this Depression. It serves to support the Thigh.

It is now apparent by what Art, this Ligament is so hid within the Cavity, that it can no ways be compressed by the Rotations of the Head of the Femur. The Depression within the Cavity has all the necessary Depth to lodge it commodiously, and allows it the Freedom of obeying in all Directions the different Motions of the Head of the Femur, without being compressed by it.

In respect to the Luxations of the Thigh, we are to know the exact Situation of the great Trochanter, and Figure of the Bend of the Buttock. The great Trochanter is placed at the external Part of the Thigh a little backwards, and if a Line was drawn through the Middle of the Crista of the Ossa Ilia, it would fall precisely upon that Process.

As for the Bend of the Buttock, it resembles a Crescent, and depends upon the Flexure, which the *Glutæus maximus* makes from the Extremity of the Coccyx to the great Trochanter. As the Skin is obliged to accommodate itself to this Flexure, it makes a Bend of the same Figure.

The external Configuration of this Muscle cannot therefore anyways change, unless the Figure of this Bend be changed at the same Time. It is easy to judge, that when the Head of the Bone is forced to quit it's natural Place, it must be luxated more easily forwards, and downwards, than on the other Sides; first, because the Cavity is shallower; secondly, by Reason of the Notch, which is only closed by a Ligament, that facilitates the Exit of the Head; thirdly, because as the Ligament within the Cavity, is very near the Edge of the Notch towards the Foramen ovale, the Head of the Femur is at Liberty to remove further on this, than on the other Sides, and yet this Ligament shall not be in much Tension, nor oppose the Luxation. Forwards; for the Head of the Femur can only leave it's Place in Proportion to it's Elongation, or when it is ruptured.

It is likewise easy to judge that it's Luxation upwards, that is, upon the Os Pubis, is the most difficult, and most terrible; first, because the Sides of the Cavity being very deep up-
wards,

wards, they form a greater Obstacle; secondly, because the flat Ligament cannot, without rupturing, lengthen sufficiently to allow the Luxation in that Direction; thirdly, because the Muscles that oppose this Luxation, which are chiefly the Obturators, and Glutæi, are very strong.

In the Luxation backwards the flat Ligament must rather be ruptured, and separated from it's Attachment to the Acetabulum; and this is likewise one Reason, why they happen more rarely.

Now it will be easy to discover at what Part of the Acetabulum, the Bones can most easily get out; in what Situation the Patient must be at the Time of the Luxation; and by what Violence the Head of the Bone is forced out of it's Cavity. If all these Circumstances are carefully examined it will be evident, that there is a very great Difference between the Manner, in which the Head of the Bone is displaced, and the Situation it is in after the Dislocation.

Though the Head of the Bone is met with in different Places after the Luxation, nevertheless it can only pass out by two Ways, and the most common is at the internal Part of the Cavity, for the Reasons that have been already given, especially on Account of the Ligament which does not oppose the Exit of the Bone, and which is less extended in this, than in any other Luxation; for the bony Sides of the rest of the Acetabulum are so deep, that they do not permit it to get out any where else; besides, the Thigh in general is only luxated when bent, or in a forced Extension; that is, when the Head of the Bone is almost entirely out of it's Cavity. Thus when I spoke of the Arm, I said that it is very easily luxated, when raised; and this exactly directs the Head of the Bone that goes out at the lower Part of the Cavity to be thrown forwards or backwards, these are the different Situations of the Body, and Thigh.

For Instance, when a Person pulls a Load towards him, one Leg being placed before and the other behind, and the Load slips, then if he falls obliquely backwards upon the Thigh that is behind; which has a Disposition that Way by the Situation the Head of the Femur is then in, it will be obliged to quit the Acetabulum at the internal Part, and be placed in the Foramen ovale.

The same Luxation may happen, when in walking the hind Foot slips as it parts from the other, as is generally the Case, and the Body falls backwards in the same Manner.

The Thigh is luxated backwards, when in walking a Person falls upon his Knees, with his Thighs bent, and the Body inclined

clined upon one Side. Then the right Thigh being pushed obliquely from forwards backwards, as well by the Weight of the Body, as by the Impression made at it's inferior Extremity, will be luxated, and carried backwards; the Head of the Femur will therefore quit it's Cavity.

The Thigh is luxated upon the Pubis, when we fall upon the Knees, with one Thigh very much extended, and the Body reclined upon the Os Sacrum, making an obtuse Angle with this Thigh. The Force of the Weight, and the Resistance of it's inferior Extremity then luxate the Thigh, and raise it upon the Pubis.

It is reasonable to believe that almost all Luxations occasioned by the violent Impressions of external Causes are effected by a Lever of the first Kind, whose Powers are at the Extremities, and the Point of Support between them; for the Limb that is to luxate ought to be considered as a Lever, and the bony Pieces that limit it's common Motion, it's Point of Support; the Head of the Bone is the short Arm of the Lever, and the rest of the Limb is the long Arm; the Ligaments that embrace the Head of the Bone are one of the Powers, the Action of external Bodies applied to the long Arm is the other Power.

When the Luxation is owing to a Fall, it is effected by a Lever of the third Species, where the Point of Support is at the Extremity of the Bone. The Weight of the Body is the Power that overcomes that, which is betwixt the Point of Support, and the Ligaments, and the Part that is to be forced.

Let us apply this Principle to the Luxation of the Thigh upon the Foramen ovale. The Head of the Femur embraced by the Ligaments is the little Arm, and it must be considered as the Power to be forced; the long Arm is the rest of the Femur, whose Extremity is the Point of Support; the Power that overcomes it is the Weight of the Body. If the Body is inclined forwards, that is, so that it's Weight bears upon the Os Pubis, and the Thighs be near each other, the Head of the Femur is thrown to that Part, where the Support of it's inferior Extremity, and the Weight of the Body push it, that is, that sliding underneath the Quadratus Muscle, it goes to be placed upon the Tuberosity of the Ischium. If the Body is inclined to the right Side, that is, if the Load is thrown there, and the Thighs are separated, then the right Thigh is luxated, it's Head being directed downwards, and sliding under the Pectinæus, will place itself upon the Foramen ovale. On the contrary, if the Weight of the Body falls upon the opposite Side.

Side of the Luxation, the Head of the Bone is thrown backwards, and goes to lodge under the Glutæi.

It is evident from what has been said, that, though the Head of the Bone always gets out at the same Part of the Acetabulum, it may nevertheless be luxated three different Ways, by being placed in three different Parts, and that it is only thrown forwards, or backwards, according to the different Situations of the Body and Thighs.

The Head of the Femur may then lodge in four different Places, two inwards, and two outwards. Let us endeavour to show by certain Signs where it is placed.

Of the two Luxations inwards, the most common is downwards, when the Head of the Femur is placed in the Foramen ovale. In which Case, see what is observed according to the different Situations of the Patient.

If he is laid upon his Back, this Leg appears a little longer, because the Foramen ovale, where the Head of the Bone lodges, is lower than the Acetabulum. If both Knees are bent, and compared, that of the injured Leg is higher. The Foot and Knee are turned outwards, because the Glutæi are most in Tension, and they turn the Thigh outwards, and consequently the Leg and Foot. This Thigh cannot be carried inwards without Pain, because, by moving it in this Direction, the Insertion of the Glutæi are removed further from their Origins, and consequently more extended. The Heads of the Triceps are in Tension, and push the Scrotum a little towards the sound Side, on Account of the Head of the Bone that is in the Foramen ovale, and which forces the Heads of those Muscles inwards. It is universally said, that a Tumor appears below the Groin, near the Scrotum, and a Depression at the Joint, and it should seem, that the displacing of a Head so large as that of the Femur, ought to render these two Circumstances very visible; nevertheless, it is very difficult to ascertain the Situation of the Head, even in thin Subjects, and no Depression is to be felt in the Articulation. The Reason of that is, the Tendon of the Flexors of the Thigh cover the greatest Portion of the Head of the Femur, and nothing gives Way, where it is lodged. It is so closely wedged in, and it forces the Obturator Muscles so violently inwards, that the Bulk of the Groin appears scarcely increased.

When the Patient is laid upon his Belly, the Bend of the Buttock of the injured Side seems changed, and, instead of describing a Crescent, it makes an Angle somewhat obtuse, as if the Middle of this Crescent had been pinched: This Bend is lower, and might be said to have been drawn a little downwards,

wards, because the Thigh being lower, the *Glutæus maximus* is so likewise. It is also apparent, that the Heel falls lower, because that Leg is longer.

When the Patient is held straight, we observe that he is obliged to keep the disordered Leg bent, because it is longer than the sound one; and, as his Foot then only rests upon his Toes, that he may ease himself, and place the Sole of his Foot upon the Ground, he always separates this Leg from the other; and, if he is made to walk, he throws his Foot outwards, describing a Semi-Circle, as well by Reason of the Length of the Leg, as to avoid striking against the Ground with the Point of the Foot.

If whilst he stands, the Joint being uncovered, the Situation of the great Trochanter is remarked, it will appear to have changed its Place; and, instead of being at the external Part, and a little posterior to the Thigh, it is lowered, and more or less sunk in, as the Head is more or less removed towards the Pubis.

At first the Leg is very stiff, the Patient can neither turn it to the right nor left without great Pain; nevertheless, the Muscles accommodate themselves gradually to this Displacing; some are relaxed, others are extended, and others contracted or shortened, and the Head of the Bone finds a solid Support upon the Edges of the Foramen ovale. Indeed, Experience teaches us, that those who have remained with it unreduced can, notwithstanding walk, and support themselves firmly enough upon that Thigh.

To prevent those in that Condition from supporting themselves upon the Toes when they walk, and their Knees from remaining bent, it must be kept extended by Means of some Splints, and the Shoe Heel of the sound Foot is to be made very high, and the other very low.

The Signs of the second Luxation inwards, and where the Head of the Bone is placed upon the Pubis, and upon that Part where the spermatic Vessels pass, are, first the Head of the Bone forms a Tumor like a Bubonocèle; Secondly, the Knee, Leg and Foot are turned more outwards than in the preceding Dislocation, because the Obturator Muscles, and Gemini, being further removed from their fixt Point, are in Contraction; the Thigh is a little extended, because the *Glutæi* are likewise in Tension; it is shorter, because it is got higher; it cannot be bent forwards without great Pain, because the *Glutæi*, being already very much extended, cannot obey this Motion, unless their Fibres be strained; besides, the Head of the Bone compresses the Femoral Nerves and Vessels
more;

more; the Trochanter is higher, because the Thigh is carried upwards; the Bend of the Buttock now only describes a straight Line, that crosses over from the Anus to the Center of the Acetabulum; the Patient is troubled with a Retention of Urine, his Scrotum is tumified, and his Thighs are benumbed and swelled, Symptoms that are the Consequence of the Compression of the Spermatic and Iliac Vessels, and anterior Cord of the femoral Nerves.

Those People are in great Pain from this Compression, especially when they attempt to bend the Thigh forward, as has been said. The Leg wastes, if the Dislocation is not remedied, and if this Accident happens before it has attained to its Growth, it grows no more. They support themselves with great Difficulty upon this Leg, they turn it in walking like those who have a wooden one, they carry a Stick to support themselves upon the sound Leg, and they throw themselves backwards in walking.

Let us now examine the Luxations, that happen backwards or outwards. The first is that, where the Head of the Femur rests upon the Side of the Tuberosity of the Ischium.

It is first necessary to examine the Figure of the Leg; for the Knee, Leg and Foot are turned inwards, which is an infallible Sign of this Luxation; because the Adductor Muscles, named Triceps, being farthest removed from the fixt Point, are greatly extended. That is likewise the Reason, why the Thigh cannot be carried outwards without Pain, because the Fibres of these Muscles are then still more elongated. When the Patient is laid down, the disordered Leg is a little longer, because it is lower than the Cavity; nevertheless, it is shorter when they are standing, because the Head of the Bone having no other Support than the Glutæi, re-ascends more or less, when rested upon. Wherefore, those People at first set the whole Sole of the Foot upon the Ground; nevertheless, they afterwards support themselves upon the Toes only, because the Head of the Bone having been forced higher, the Leg is become shorter. The Buttock is larger on Account of the displaced Bone, and it's Bend is higher because the Thigh is raised; the great Trochanter is lower and more prominent, and the Sciatic Nerve is compressed, which causes the Numbness; yet, this Sort of Cripples can walk, even without a Stick.

In the second Luxation outwards, the Head of the Femur is raised towards the Glutæus minimus. Then the Leg and Foot are turned more inwards than in the preceding Luxation, and the Patient can neither extend, nor turn his Foot outwards, it
is

is totally bent towards the Groin, and he cannot walk without Crutches, the upper Part of the Buttock is very large, and it's Bend very high, the Head of the Femur being placed at the superior external Part of the Acetabulum.

Sometimes the Ligament within the Joint of the Thigh, and the circular, are swelled, whereby they push the Head of the Femur upon the Edge of the Cavity. Those People halt, because that Leg is longer than the other.

To diminish the Swelling of the Ligaments of the Joint, and make the Head of the Femur re-enter into it's Cavity, we must advise those People to drink the Decoction of the Woods, and purge with Hydragogues.

Those Symptoms at first give Reason to suspect a Dislocation; nevertheless, if the natural Form of the Joint is carefully examined, no Change is perceptible there. When this Disorder happens, such Patients are only to be laid upon the sound Side, and the luxated Femur forced back into it's Cavity. It re-enters by the least Motion that is applied to it; the Patients themselves make it go in again when they affect a certain Situation in walking.

There are Women attack'd with a Cancer in the Breast, whose flexor Muscles of the Leg, as also the Extensors of the Thigh, are in Contraction; which is caused by convulsive Motions. I have always observed, that it is the Leg and Thigh of the sound Side. The Leg remains bent and unable to extend, and the Glutæi Muscles pull the great Trochanter so much upwards, as to carry it above the Middle of the Buttock, which causes the Head of the Femur to make a Swipe, and move towards the inferior Extremity of the Acetabulum, which in this Place is lower, and if the elastic Ligament did not likewise resist, it would entirely slip out. This Species of Luxation is incurable, as it only happens some Days before Death. Upon opening the dead Body, we meet with a Relaxation of the Ligaments, and the Head upon the Brim of the Cavity, which may be called an incomplete Luxation.

It has been observed, that Children five or six Years of Age remain impotent, that is, they lose the Motion of the inferior Extremities, without suffering much; which is owing to the Relaxation of the Ligaments, and the too great Quantity of Synovia, collected in the Cavity. In Consequence of it's Lodgment, it gradually forces out the Heads of the Femurs, and they are insensibly lodged upon the Foramina ovalia. As this Change is not perceived, we are surpris'd that, when those Children begin to move the Thighs, and endeavour to walk, they

they have a Difficulty, are unsteady, and throw their Bodies sometimes to the right and sometimes to the left, which only proceeds from the Displacement of the Heads of the Femurs, which are removed from their Cavities, and fallen down into the Foramina ovalia, where they lodge. What is particular is, that there it forms a bony Cavity as hard as the natural one. This I have shown in the dead Body of a Child ten or twelve Years of Age. These Sorts of Luxations may be owing to the first Conformation, or to a difficult Birth, where the Infant has been extracted by the Feet.

In the Dislocations of Adults that could not be reduced, the Stay of the Head of the Bone, whether in the Foramen ovale, or at the superior external Part of the Acetabulum, occasions an Extravasation of ossific Juices, which ought only to be attributed to the Erosion of the Cartilage; that covers the Head of the Femur, or to the Effusion of the Synovia. The Head on this Occasion serves as a Mould to the Petrification of the Gluten; and as those, to whom such an Accident happens, can only remain laid upon the Back, or half seated, the Head performs some little Motions, which allows them the Liberty of moving themselves, from Time to Time; this depends likewise upon the different Attitudes it is necessary to put the Patients in to ease themselves. Many Practitioners have seen of those Species of Luxations, where the artificial Cavity is larger or smaller, sometimes with and sometimes without Inequalities. It's Bottom projects within the Pelvis, and then the two Obturators and their middle Partition are ossified, a large Vacancy in Form of a Notch remains at the anterior Part of the Foramen ovale for the Passage of the Vessels coming from the Hypogastrics to be distributed in the Pectineus, and Triceps, and the posterior Cord of the crural Nerves passes there.

In these Luxations, the Acetabulum is preserved quite intire in some, in others it is half closed; this is merely owing to the Dilatation of the new Cavity. The great Trochanter is then near the artificial and cotyloid Cavity; whereas, in the natural State, it is at a very great Distance from both.

The Contraction of the artificial Cavity, or what may be called it's Entrance, terminates at a small Distance from the Beginning of the Neck of the Femur, where it makes a circular Edge that is very uneven, and cut by unequal Indentations, which answer to Spaces, or Depressions proportioned to their Largeness, at the Circumference of that Cavity, which makes a mutual Reception, that may be compared to a Suture, except

except that those Pieces have sufficient Space to allow the Head of the Femur the Liberty of rotating therein.

Those, to whom the Luxation in the Foramen ovale happens on both Sides, generally remain with their Thighs bent in an horizontal Situation, and lame the Rest of their Lives; consequently they cannot walk, or remove from one Place to another, but by supporting themselves upon their Hands, and the whole Body rests upon the Tuberosities of the Ischium. Those People are called *Cul de Jatte*.

The Luxations of the Foramen ovale, have, nevertheless, deceived many very able Surgeons and Physicians. They have imagined, that those who had fallen only remained Cripples in Consequence of the Fracture of the Neck of the Femur. The Deception has continued a long Time, and Mr. *Hunauld*, Professor at the King's Garden, supported the contrary Opinion by many Facts, which he had from the late Mr. *Ruyseh*; but at present, that Error is entirely exploded, by examining the dead Bodies of several, where those Species of Luxations have been really met with.

The Dislocation of the Foramen ovale is the most frequent of all, as the Head of the Femur has not the Breadth of two Lines to pass over, in order to fall therein. What still favours it, is the Breach of the Cavity there.

It is not the same with the Luxation, where the Head of the Femur is pushed upon the superior external Part of the Acetabulum, and sometimes on the Middle of the convex Part of the Ilium. It is not easy to explain how it can be carried thither, unless by the most violent Fall. In this Dislocation, all the Muscles of the Thigh lose their natural Situation. Some are relaxed, as the *Glutæi*; others as the Abductors, are extremely elongated; lastly, the Flexors, and Triceps must be partially lacerated. Some belonging to the Leg, may be likewise added to the Number of displaced Muscles.

That Luxation is most to be dreaded, especially when it cannot be reduced; and though it should, the Motion of Progression is to be despaired of. I have frequently shewn a similar one of the right Side, where Nature had formed a Cavity, like the natural one, but the Head of the Femur was ankylosed therein.

Blows, or Falls, upon the upper external Part of the Thigh, push the great Trochanter so violently, that it occasions the Head of the Femur, to strike against the Bottom of the Acetabulum. This Stroke, insensibly causes a Luxation from an internal Cause. It is not surprising, therefore, that those to whom these Accidents happen remain lame, and are obliged to keep their

their Room, and in Case they will walk, it must be by the Use of Crutches. In some the Cartilage, that covers the Acetabulum, dries, and cracks, which occasions an Ankylosis; in others, the Extremity of the Head of the Femur swells, and causes the same Accident; in others, again, the officic Juices extravasate, and change it's Figure. Lastly, there are Cases, where the Ligaments are so moistened, and relaxed by the Abundance of Synovia, that the Head continues a long Time at the Entrance of the Cavity, unable to re-enter; wherefore are Abscesses, Caries, and Species of Extoses met with, either during the Patient's Life, or after Death.

In general, all the Species of Luxations of the Thigh from external Causes, require a quick Reduction to prevent the terrible Consequences, particularly in very fat and fleshy People; and this Accident is always very bad, which is easily conceived, for, first, it is very difficult to distinguish the Species of Luxation, though the most certain Signs drawn from the Situation of the Foot, whether inwards, or outwards, ascertain it, for they become doubtful in many Cases; secondly, the Swelling and Tension of the Muscles and Teguments, prevent the Discovery of the Disease.

Indeed it can neither be ascertained by the Sight, nor Touch, as it may be in the Luxation of the Arm, where the deltoid Muscle is flattened, the Vacancy of the glenoid Cavity is easily distinguished by the Feel, and the Acromion is rendered very obvious to the Sight; but in the Thigh, the Extension of the Aponeurosis of the Fascia lata alone, by it's Resistance, prevents the Discovery of the Accident. Thirdly, the Disputes, that have been handled some Years ago, concerning the pretended Separation of the Head of the Femur from it's Neck, have made the Possibility of the Luxation doubted, but this Doubt has been cleared up by Facts from Practice, which have demonstrated the Impossibility of it's happening in the Adult. Fourthly, the Fracture of the Neck of the Femur, near it's Head, no Way differs from the Dislocation of this Part. The Foot, Leg, and Thigh, may be carried in different Directions; that is, they may in both Cases be thrown inwards, or outwards, forwards, and backwards. It is true, that the Fracture like the Luxation is very difficult to be found out; in such a Case therefore, the Surgeon ought never to be blamed, especially when he is intelligent, and experienced.

In thin and dry People, the Dislocation may be easily distinguished, and felt by the Size of the Head of the Femur. It is necessary to consider that, when the Femur is luxated, and it's Head

Head lodged; and fixed in a Place, the Thigh is more difficult to be moved, than when the Neck is fractured.

The Luxation of the Head of the Femur upon the Os Pubis is very bad, as before-mentioned, and if it remains long unreduced, very terrible Symptoms ensue; therefore are we to try to reduce it by Extensions and Counter-Extensions, and bring the Head down towards the Foramen ovale. If we cannot effect it, the whole Extremity is threatened with a Gangrene by the Compression of the crural Vessels. This Compression may also act upon the Spermatic Cord; which is proved by a Number of Observations.

The Dislocation of the Head of the Femur in the Foramen ovale, when it cannot be reduced, is irksome to the Patient, as it prevents the Motion of Progression. It's Reduction is not easy when it is sunk into the Obturator Muscles, and if the Patient has neglected to ask Assistance at the Beginning, he must not expect a happy Event. There are nevertheless Patients, who walk without Crutches, and, as that Leg is longer than the other, the Body inclines more to the opposite, than to the diseased Side. To prevent the entire Loss of Progression by this Accident, the Thigh, Leg, and Foot must be kept extended and straight, during the Formation of the new Cavity. It will be proper to move the Head from Time to Time in the Cavity it forms, as those Motions smooth and polish it's internal Part.

The Prognostic to be given of the Luxation of the Head of the Femur placed at the superior Part of the Acetabulum, is more terrible than that in the Foramen ovale, as the Cure of the Patient ought by no Means to be hoped for. Indeed, he remains a Cripple for the following Reasons. First, the elastic Ligament is totally lacerated, or ruptured. Secondly, the Capsula, through which the Head passed out, is likewise lacerated, and as it surrounds the Neck of the Femur, it cannot but be separated from it; lastly, the Muscles having suffered considerably, as before-mentioned, we have nothing to expect, after the Head is reduced into it's Cavity, but an approaching Ankylosis, notwithstanding all our Care and Attention; for we cannot hope for the Recovery of the Elastic Ligament and Capsula.

When the Head is thrown horizontally outwards, it is stopped by the Surface of the Tuberosity of the Ischium. This Luxation is less terrible than that upwards, and more easy to be replaced; the elastic Ligament stretches upon Account of the small Space the Head has to pass; the Head of the Femur cannot proceed further

further by Reason of the Opposition of the Muscles attach'd to that Tuberosity; lastly, it must be own'd, that the Luxations of the Thigh require the whole Attention of the Surgeon, and that few happen to Adults, but some Inconvenience remains therefrom.

The Surgeon is only to expect a palliative Cure of Luxations from internal Causes; that is, he must support the Head of the Femur by a proper Bandage, that he may thereby enable the Patient to walk with Crutches, and spare him the Pain he would be expos'd to.

The Reduction of the Thigh is universally known to be the most difficult of all that happen to Man, as well in Respect to the Size, as to the Situation, and Place, the Head of the Femur occupies. In general Extension, and counter Extension are only made by Ligatures, or other Machines capable of overcoming the Resistance of the surrounding Muscles.

In order to reduce it into the Cavity, many Circumstances are to be attended to. The first respects the Species of Luxation, and the Situation of the Head of the Femur, because more Force must be exerted in some than in others, as is apparent in the Luxation upon the Os Pubis, and in that at the superior and external Part of the Acetabulum. The second is to be careful not to be deceived, i. e. that we mistake not a Fracture of the Neck of the Femur for a Luxation. Wherefore it is proper to have the Advice of other Surgeons. The third is to consider, that there are few Luxations that are not succeeded by a considerable Swelling, and Tension, which is an Obstacle to the Reduction. Lastly, the fourth Circumstance is to consider what ought to be done, and practis'd in each Species of Luxation.

In all these Luxations, the Patient must be laid upon his Back on a simple Mattress. A Ligature of a proper Length is pass'd under the Groin, one End is carried under the Buttock, and the other upon the Side of the Abdomen. They are joined together above the Hip. An Assistant holds these two Heads, to secure the Patient's Body. In Case he is not strong enough, they are fastened to something firm, that they may resist the necessary Extension.

The second Ligature is applied two Fingers Breadth above the Condyles of the Femur. A circular Compress is bound round the inferior Part of the Thigh, to prevent it from making any Impression upon the Teguments.

In the Extension where the Dislocation is upon the Os Pubis, the Thigh and Leg must be carried obliquely outwards, to draw the Head from thence. In pulling it thus, it goes to-

wards the Cavity, whereas if the Extension is made in a straight Line, the Head of the Bone tends to fall into the Foramen ovale, which is not in the least perceived. It is true, indeed, the Reduction is believed to be performed, on Account of the free Motion of the Thigh, and Relief, the Patient has obtained thereby; but after the Cure, he has the Chagrin of being lame the Rest of his Days.

When the Extension is made for a Luxation upwards, and outwards, it must be stronger than in the former Case, and the Thigh and Leg must be directed from outwards, inwards, and from upwards, downwards.

As soon as the Head is disengaged, it is pushed into it's Cavity.

As to what concerns the Luxation of the Foramen ovale, it may be compared to that of the Arm, where the Head of the Humerus is simply lodged in the Axilla. When it is recent it is easily reduced. Old Dislocations as well of the Humerus, as of the Thigh in the Foramen ovale, are incurable, as Experience proves. In order then to reduce the Luxation in the Foramen ovale, the Extension is ordered to be made, so as to disengage the Head of the Femur, and by a lateral Motion, which the Surgeon makes from inwards outwards, raising the Thigh with his Hands, the Head re-enters into the Cavity.

As for the Reduction of the Head of the Femur lodged upon the Tuberosity of the Ischium, the Space it has to pass over is no greater than in that of the Foramen ovale. The Extension being made, the Surgeon pulls the Thigh towards him; when he feels the Head free, he carries it perpendicularly from downwards upwards, to make it re-enter into the Acetabulum.

When any Species of Luxations are reduced, the Head of the Femur must be secured in it's Cavity, that no Motions may throw it out again; this is done by binding a large Compress, several Times folded round the upper Part of the Thigh. It must be kept on by the Bandage called Spica, which is made with a Band five or six Ells long, and four Fingers broad.

It is proper to remark that, during the Extension, and counter Extension, the Patient is to be turned a little upon the sound Side, to allow the Surgeon the Freedom of more exactly embracing the Thick of the Thigh, and of being assured of the Progress that is made by the Extension, and of the Situation the great Trochanter takes. But, this depends also upon the Species of Luxation and a perfect Practice in those Diseases.

Though

Though the Signs, that are given to distinguish the different Luxations, be very certain, yet they do deceive, as will be seen by the following Example.

O B S E R V A T I O N.

A Young Lady twelve Years of Age, having leaped down several Steps, could neither raise, nor support herself upon the right Leg. The Surgeon in ordinary to the Family, having examined it, perceived only a slight Contusion at the superior Part of the Thigh. He bled her several Times, and applied common Embrocations upon the Part. The Limb remained in one State, out of which the Patient could not move it. Six Weeks after, her Parents desired a Consultation. I was called in, being informed of the Fall, I endeavoured to move the Thigh. The Motions from inwards outwards, and from outwards inwards, were easily performed, and with little Pain; but it was not so in those of Flexion and Extension. I applied my Hand near the Groin, and felt the Head of the Femur lodged in the Foramen ovale, which I made the Surgeon sensible of. The Parents being informed of the Disease, were surpris'd, and it was agreed on to attempt the Reduction. The Lady was laid upon a large Table, covered with two Coverlets. Her Body was held fast, and the Extension made. I placed both my Hands at the superior posterior Part of the Thigh, pulling towards me, whilst another drew to the opposite Side. The Head was disengaged, and by a Motion from inwards outwards, I pushed it into the Cavity, raising the Thigh from downwards upwards. The Patient could not support herself upon that Thigh for near three Weeks, and she made Use of a Crutch to accustom herself to walk, which she was afterwards able to do. Whether the internal Ligament had been elongated, had lost it's Spring, or the Capsula had been relaxed, the Patient limped near a Year, but that Accident ceased, as she grew up.

II. *Of the Luxation of the Knee.*

IT is first necessary to remark, that the Heads of the Bones composing this Joint have a very large Basis, to render this Support more firm. Secondly, that the inferior Extremity of the Femur has two Condyles of which the internal is larger, and projects more inwards than outwards; thirdly, that they are divided by a considerable Cavity, that serves to lodge the crucial Ligaments as they are called, which are partly attach'd to the little Eminence at the Middle of the superior Surface of the Tibia; fourthly, two very superficial Cavities are observable at

superior Part, each of which is enlarged by a Cartilage, in Form of a Crescent, the internal is thicker than the external. These Cartilages are narrow, and only, as it were, border those Cavities. They are thicker in their Circumference, and become gradually thinner. Forwards they are strongly attach'd to the Brim of each Cavity, and backwards partly to the crucial Ligaments, and little Eminence that divides the Cavities of the Tibia. This Joint thus disposed forms a Ginglymus of the second Species.

The Ligaments of this Joint are like those of other Articulations, that is, there is a ligamentous Band on each Sde of the Ginglymus. The internal is about three or four Lines broad, and one thick. The external is narrower. It is closely united to the Tendon of the Biceps. Those Ligaments are placed more backwards than forwards, whereby the Extension of the Leg is limited.

Besides which, there are two crucial Ligaments, as before-mentioned. The one may be called anterior, as it takes it's Rise from the anterior Part of the small Process of the Tibia, and is inserted into the external, and almost posterior Part of the external Condyle of the Femur. The other, which may be called posterior, rises from the posterior Part of the Tibia, and it's little Process, and proceeds to be inserted into the internal and anterior Part of the internal Condyle of the Femur.

This Joint is likewise strengthened by a ligamentous Band that comes obliquely from the external Condyle of the Femur under the Head of the Gastrocnemius, and proceeds, 'till it be lost in the Tendon of the Semi-membranosus.

Lastly, this Joint is corroborated forwards by the large Tendon formed by the Crureus, and Rectus Cruris, and the Aponeurosis of the two Vasti; backwards by the Head of the Gastrocnemius, the Tendons of the Biceps, and Semi-membranosus, and by the Muscle called Popliteus. There is besides a circular membranous Ligament, that surrounds it entirely, and serves to contain the Synovia that lubricates it. It does the Office of a Capsula as in the other Joints.

To give a compleat Idéa of this Joint, it is necessary to say something of the Rotula.

It is placed at the Knee. It is about an Inch and a half long, and as much broad. It is slightly convex externally, and internally it has two flat Surfaces, a little hollowed, and divided by a small Ridge. The external is largest; consequently the anterior Surface of the external Condyle of the Femur, upon which it is placed, is also larger and projects further. It is by Means of these Surfaces, that the Rotula is articulated with the
anterior

anterior Part of the inferior Extremity of the Femur, which has reciprocally two flat Projections, betwixt which is a slight Depression. This Articulation forms a Ginglymus of the first Species.

The Surfaces by which these Bones touch are covered with a very smooth Cartilage. Now we are to examine how the Rotula is secured there.

To comprehend which, it is necessary to know exactly all the different Points of Attachment of the Aponeurosis formed by the Extensor Muscles of the Leg. First, it is remarked, that the Re-union of the tendinous Fibres of the Cruereus and Rectus Cruris from a thick Tendon, that is inserted into the superior and lateral Parts of the Rotula; that a Portion of the Fibres of this Tendon by their Expansion, embrace all the Rotula; and that they are afterwards united to the Ligament, that connects it to the Tibia. Besides that, each Vastus forms a very large Aponeurosis, part of which is inserted into the Side of the Rotula, and united to the above-mentioned Tendon, and the other proceeds to be inserted into the Side of the Tibia.

Besides all these Bands, the Rotula is still fortified by a Ligament peculiar to it, and which is very thick at one of its Extremities. It is inserted into the Tuberosity of the Tibia by one Part, and by the other to the inferior Extremity of the Rotula, where it is united with the fore-mentioned tendinous Fibres.

As to the Use of the Rotula, it certainly ought to be considered as a Pulley that serves to facilitate the Action of the Extensors of the Leg. The Bones alone touch, and as their Surfaces are very smooth, the Friction is very small. The Rotula serves likewise to increase the Force of the Muscles by removing them from the Center of their Motion.

It is easy to judge from the Conformation of this Joint, that the Leg can be but rarely luxated, and it might be said to be almost impossible that it should be dislocated lengthwise, that is, that the Pieces can slide upon each other. If that was possible, the Luxation would only happen downwards, and backwards, because the Condyles are much more rounded there than forwards, and the Joint less strengthened, but one cannot be persuaded of a Dislocation of the Knee forwards. Indeed, when we have seen how closely it is embraced by the Aponeurosis of the Extensors of the Leg, whose Texture is so firm and compact, one would be inclined to think that even the true Luxations are absolutely imaginary.

When the Luxation is backwards, or downwards, if it happens, which seems very difficult, the Leg is shorter, greatly deformed, and remains straight.

As to the compleat lateral Luxations, where one of the Condyles quits it's Place, and takes that of the other; I am likewise of Opinion they can never happen, unless the Ligaments, as well as many Tendons, be entirely ruptured. In such a Case the Reduction is not to be attempted; Amputation is the most sure Means to save the Patient. It is, nevertheless, proper to neglect nothing to remedy the Symptoms and save the Limb: The Patient had much better be a Cripple.

The Knee cannot then in general suffer any other Luxation, except an incompleat one, which is when one Condyle is dislocated, and the other simply turned round. Then the Leg is crosswise, and turned to the Side of the Luxation. This incompleat Luxation may be refered to the Sprain, as well of the Ligaments as Tendons; which is merely occasioned by a very strong Extension.

As for the Rotula, it is very evident, that it can neither be luxated upwards nor downwards, but only laterally. It is well known, that the Ligament that attaches it may be entirely ruptured. Then it is drawn upwards by the Contraction of the Extensors, and quits the Cavities, or Surfaces of the Femur, whereby a Vacuity is to be felt at the Middle of the Knee, and an Eminence above; but that Separation should not be considered as a Luxation. This Disorder is incurable; for though the Rotula be pushed back again into it's Place, it cannot remain there, it must necessarily rise up again. I have given an Example of the Rupture of this Ligament in speaking of the Fracture of this Bone.

The Surgeon must use his utmost Care in all Falls upon the Knee. He ought not at first to torment this Joint too much, for the Reasons before-mentioned. He should first try to calm the Pains of the Patient, by repeated Bleedings, especially if he is strong; to apply mild Topics, capable of relaxing and diminishing the Tension of those tendinous and aponeurotic Parts, and to thus prevent the Lodgment of the Synovia, which might occasion fatal Consequences.

The Knee, for the first Days, must be only slightly bound up with Compresses, and a Bandage that may be removed without stirring the Leg. Such is the eighteen-tailed Bandage.

The Symptoms being a little appeased, all the Parts composing this Joint must be strictly examined, to find out those that are hurt, in order to rectify them; and let there be the least Apprehension by the little Success from the Bleedings, and Topics, that there is some considerable Disorder, we must not hesitate in desiring Assistance, to avoid the Censures of the Patient,

tient, or Assistants. How many Patients have there not been seen, who have been treated whole Years without Relief, and whose Symptoms were so increased, that Amputation has been the last Expedient, or even Life has been lost.

III. *Of the Luxation of the Foot.*

THE Articulation of the Foot is chiefly formed by the Conjunction of the Tibia and Astragalus. Upon these two Bones, the Motions of Flexion and Extension are alternately performed. They are reciprocal, that is, the Tibia moves upon the Astragalus, and the Astragalus, which is the Basis of this Articulation, moves upon the Tibia. These reciprocal Motions are a Ginglymus of the first Species, whose Eminences and Cavities are very superficial. This Articulation differs from that of the Ulna, as it allows the Foot a free lateral Motion, but it is only by some violent Shock, that the Foot is reversed upon either Malleolus. The Fibula only serves this Joint as a Support by Means of the external Malleolus.

This Joint is then strengthened by the two Malleoli, or Ankle Bones, that embrace the Sides of the Astragalus, with which it is articulated. The Surfaces by which these Bones touch are covered with Cartilages.

The Conformation of the Sole of the Foot renders it very subject to be reversed on the external Malleolus, therefore it is longer.

It is likewise strengthened by very strong Ligaments that connect the Malleoli to the Astragalus and Calcaneum. The Fibula is likewise corroborated by Ligaments, that keep it closely joined to the Notch of the Tibia, wherein it is received, that it may oppose it's Separation. There are others that go off from it's anterior Extremity, and are attach'd to the Astragalus above it's Notch. The transverse Ligament, and several others, whose Plans have different Directions, placed at the anterior Part of this Articulation, serve to keep in the Tendons, which resist the Luxations. Besides, the Sheaths through which the Tendons pass, that serve to the Motions of the Foot and Toes, are as so many Cords, that fortify this Joint.

Notwithstanding these Resistances, all Authors agree, that the Foot may be luxated forwards, backwards, inwards and outwards, that the two first Species may be compleat, but that it is not without great Difficulty luxated laterally, unless there be a Fracture; otherwise these two Sorts of Luxations are always incompleat, for they cannot happen, unless both Malleoli

be greatly separated, or that of the luxated Side, or unless the Tibia or Fibula be fractured, which renders its Treatment very troublesome and tedious.

When the Foot is luxated forwards, the Calcaneum appears very short, and the rest of the Foot very long; then the Heel scarcely projects. The Foot remains bent, because the Flexors are removed further from the Center of their Motions than the Extensors.

When the Foot is dislocated backwards, the Heel becomes longer, and the Foot is very short, and, according to the common Rule, the Foot remains extended.

Amongst the incompleat Luxations of the Foot, the most common is that outwards; because, in a false Step, the whole Shock upon the Astragalus acts upon the End of the Fibula, or external Malleolus; now this Force must be very violent to displace, or fracture that Bone, as Nature has been very careful to strengthen that Part of the Foot well, as before-remarked.

When the Foot is luxated on the external Malleolus, that is, outwards, it is turned inwards by the great Tension of the Muscles appointed to that Use. The contrary happens when the Dislocation is inwards.

All Authors to the present Time appear to have known those Species of Luxations, and to have followed one another, and mistaken the forced Extensions of the Tendons and Sprains, for true Luxations. But, in order to give a just Idea of those Disorders, and make them plain, it is proper to show, that these Luxations are more difficult than is imagined, whether on Account of the Manner in which these Bones are articulated with one another, or of their Situation.

The Calcaneum serves as a Support to the Astragalus, with which it is closely articulated. Its Situation is such, that the external Part of it's Body is out of the Center of the Articulation, the better to resist Shocks. It's anterior upper Surface is hollowed, and divided into two. Upon it the Astragalus is placed and articulated. This Support answers to the Center of the Articulation of this Bone with the Tibia; without that, the Equilibrium of the Body, and the Center of Gravity would be every Moment disordered.

The Os Calcis and Astragalus are so closely joined together, that the first serves as a Basis to almost the whole Bottom of the Foot; and the second, by it's Articulation with the Leg, serves to the Motion of Progression.

The Calcaneum is joined by it's anterior Extremity with the Os Cuboide. It's Motion is imperceptible. The anterior

rior Part of the Astragalus forms a Head, which answers in Size to the Cavity of the Os Naviculare. I have spoken of that Articulation in treating of Sprains.

Let us now explain how the two first Species of Luxation may happen, that is, those forwards and backwards, and where in each the Tibia and Fibula are certainly placed. This, Authors are silent about.

Falls and Blows are known to be the first Causes of these Accidents, and they are more than sufficient to occasion the Luxations of the Foot, of what Kind soever they may be. Experience but too often proves that they are almost all accompanied with Fractures, most of which become incurable, and even kill, if not remedied by Amputation.

As for the compleat Luxation of the Foot forwards, besides the aforesaid Causes, it can only happen by a false Step, or when the Foot is unfortunately wedged in between two Stones, or Pieces of Wood. The Foot being thus fix'd by an immovable Resistance, the Body must necessarily incline to one Side or other. If the Fall is forwards, the Ligaments, that connect the Foot with the Leg, lacerate and rupture, notwithstanding the Resistance of the Tendo Achillis and Extensors of the Foot, and the Tibia and Fibula are forced backwards, and rest upon the Os Calcis, which renders the Heel very short, and makes the Rest of the Foot appear longer. If the Luxation does not happen in this Case, a Separation, or a most violent Extension must be the necessary Consequence.

The Dislocation backwards can only be owing to the same Causes. It differs from the Luxation forwards, inasmuch as the Fall of the Body is contrary; that is, the Persons falls backwards, consequently the Extensors of the Foot are relaxed, or at least are not in Contraction; the Ligaments are ruptured, the Tibia and Fibula are thrown forwards, notwithstanding the Tension of the Flexors of the Foot and Extensors of the Toes, and are placed upon the Naviculare; the Foot then is thrown backwards, which makes the Heel very long, and the Foot very short. The Separation, or Extension, may happen as that forwards does.

It has just now been demonstrated, that in the Luxation forwards the Tibia and Fibula quit the Astragalus, are thrown backwards, and the Foot pushed forwards; on the contrary in the Luxation backwards, the Tibia and Fibula are carried forwards, and the Astragalus backwards.

The more the Structure of the Foot, and it's Articulation with the Leg are examined, the more perplexing is the Choice of the Means proper to cure the different Luxations before-mentioned;

mentioned; but, as our Business is to relieve a Patient, we are to follow the good Principles that Surgery daily draws out from the Knowledge of the animal Oeconomy. Those ignorant thereof neglect them, but the Consequence is, that they are the Cause of the Death of an infinite Number of People, or else lame them for the Rest of their Days, or render them unable to attend to their Affairs, whether through fistulous Ulcers, or an Ankylosis and Loss of Motion of the Foot, which are the Consequences of a bad Treatment.

The Displacement of the Calcaneum must be allowed a rare Case, and almost impossible, on Account of it's Situation, and strong Attachments, and, if it should happen, it ought not to be ranked amongst Luxations, for it's Attachments with the neighbouring Bones certainly render it's Motions hardly discernible. It would be very difficult to undertake such a Reduction. The only Way to prevent the Symptoms is the Extirpation of the Limb.

The Articulation of the Astragalus with the Naviculare frequently causes Symptoms of long Duration, and even hardly to be cured, as I have remarked in speaking of Sprains. It is sometimes forced entirely out of it's Articulation, though it be bound and attach'd by very strong Ligaments, and placed, as it were, secure from external Impressions by the Tibia and Fibula. This is apparent by a particular Observation related by Fabricius Hildanus. He says, that a Priest having leaped down a Cause Way three Feet high, the Astragalus was entirely displaced with a Wound, and that, as it only held by some Fibres, the Surgeon cut it out, that the Patient was treated, and has walked without a Stick.

I am going to relate two Cases that are nearly similar to the preceding.

OBSERVATION I.

ONE Sintard, a Gardiner, in Seine Street, behind the King's Garden, endeavouring to raise the Branch of a Tree, that he might more easily do it, made Use of an Engine. Having placed it upon a Plank to serve him as a Point of Support; when he had raised up the Branch to a certain Height, the Plank broke, and his left Foot was caught betwixt the Engine and Branch. The Extension and Compression were so violent, that the Astragalus was broken in two. The superior Portion was forced from under the Fibia, and pierced the Skin, Sock, Stocking and Shoe. After the Foot and Leg were laid bare, all the Ligaments, and several Tendons, were found lacerated. The inferior Portion remained in it's Place, and articulated with

with the Astragalus. After a Consultation of several skilful Practitioners, it was agreed that there was nothing else to be done but to take off the Leg; which was effected, and the Patient would have been perfectly cured, if he had not, unknown to the Nurse, imprudently eaten a large Dish of Cabbage Soup. In Consequence thereof the Suppuration was suppressed, the Fever came on, and the Matter was re-absorbed, which was succeeded by Death. Hildanus's Observation differs from this, inasmuch as the Astragalus was forced out.

OBSERVATION II.

A Very strong robust Man, about thirty Years of Age, having fallen into the Moat at the Entrance of Vincennes, was brought to the Hotel-Dieu. Mr. Mery having examined the Patient's Foot, found a transverse Wound three large Fingers broad, the internal Malleolus fractured, and the Tibia separated from the Astragalus, which was almost bare. Mr. Mery proposed Amputation, but the Patient would never submit to it. In Consequence thereof, he ordered the Leg to be held by one Assistant, and the Extension of the Foot to be made by another. He pushed the Tibia upon the Astragalus, and replaced the Malleolus. The Wound was dressed, and the Patient bled plentifully. No Symptoms appeared for three Days; it was believed, in Consequence of an ouzing, that the Wound tended to unite, the Patient had not even been in much Pain. But a Train of Symptoms came on, Fever, intolerable Pain in the Joint, the Lips of the Wound pale, Separation of the Epidermis, so considerable a Swelling of the Leg and Thigh, that if the Patient should have desired the Operation, they durst not have undertaken it. At length the Mortification appeared at the Thigh, before it passed to the Leg, and the Foot remained almost in it's natural State, except that the Skin became of a pale orange Colour, and very hard.

That Accident may be explained in the following Manner:

At the Instant of the Fall, the Foot only pressed upon the Ground, and the Collision was so violent, that all the Vessels were compressed and closed, which is called a dry Gangrene. As the Course of the Spirits and Fluids were obstructed at the Foot, it is not strange that the Patient continued three Days free from Symptoms, and as the principal Arteries could not distribute the Blood to it, it is not difficult to comprehend, that it could not be returned; which was the Cause of the Swelling of the Leg and Thigh, and Mortification. These Observations may be considered as common both to Fractures and Luxations.

When

When those Species of Luxations are to be reduced, a great Deal of Prudence is requisite; that the Extensions and Counter-Extensions be properly regulated, for Fear of lacerating the Rest of the Ligaments, and rupturing the Vessels; and lastly, to prevent the Tendons and Sheaths, that surround this Joint, from being contused, which would encrease the Symptoms.

It is then necessary to attend to the Species of Luxation and Situation of the Bones; the proper Treatment being different according to the Cases. For Instance, if the Luxation is outwards, the Patient's Leg is ordered to be held by an Assistant, the Surgeon takes hold of the Foot, drawing it towards him; the Extension being made, he pushes it inwards. If the Foot is dislocated inwards, he does the same, but he carries the Foot outwards. This Operation chiefly regards incompleat Luxations.

Let us now see what Conduct is necessary in compleat Luxations, viz. that forwards and that backwards.

These two Species are always succeeded by Swelling, Tension, Ecchymosis, which is the Reason why they are not clearly distinguished. Wherefore, mature Deliberation is necessary, before the manual Part be undertaken, for the Reasons mentioned elsewhere.

The Luxation forwards, as I have remarked, makes the Foot much longer, which distinguishes it. In order to reduce it, the Patient's Leg being held firm by an Assistant at some Distance from the Malleoli, the Surgeon embraces the Sole of the Foot with one Hand, and with the other endeavours to grasp the Heel to pull it towards him. During this, with the Hand that embraces the Sole of the Foot, he does the same to remove the Foot, and give the Tibia and Fibula, that rest upon the Calcaneum, Room to remove. When the Surgeon judges the Extension sufficient, he pushes the Sole of the Foot from forwards backwards, in order to replace the Astragalus in the Cavity of the Tibia.

In the Luxation backwards, it is necessary to recollect that the Heel is longer, and the Foot very short; consequently the Tibia and Fibula are situated upon the Naviculare. In order to reduce it, the Leg being held firm, as before-mentioned, the Surgeon grasps the Heel with one Hand, and the Metatarsus with the other. Having made such an Extension as he judges necessary to remove the Foot from the Tibia and Fibula, he pushes the Foot from backwards forwards, to put the Astragalus into the Cavity of the Tibia.

If, after Trial of Extensions and Counter-Extensions, the Bones cannot be restored into their natural State. Several Authors

OF THE FOOT.

thors propose Ligatures; but most of the present Practitioners consider the Application of them as rather hurtful than useful, because they only act upon the Tendons, which are greatly extended and displaced. It must be allowed that Ligatures are of great Service in the Luxations of the Arm and Thigh; but of those of the Foot, such as I have related, all the Ligaments of the Joint are lacerated; therefore, to restore the Bones of the Leg upon the Astragalus, or the Astragalus into the Cavity of the Tibia, the Motions of the Hands are sufficient, since, by Reason of the Situation the Bones of the Leg are in, they resist but weakly. Indeed, they are not entangled as in the Dislocations of Bones articulated by Enarthrosis. I have elsewhere remarked, that all the Luxations of Bones articulated by Ginglymus are generally accompanied at the Instant with great Tension, Swelling, Ecchymosis; now these Symptoms forbid the Use of Ligatures.

After the Reduction, the Apparatus consists in surrounding the Foot with a slit Compress, wet in a defensive, which is kept on by different Turns of a Band round the Malleoli, and whole Joint of the Foot. This Bandage ought only to be contentive for the first Days, the Foot and Leg are to be laid upon a Pillow somewhat raised, to facilitate the Return of the Fluids. I believe to hasten the Decrease of the Inflammation, and calm the Pain, which is inseparable from these Sorts of Luxations, instead of using a Band, the eighteen-tailed Bandage ought to be preferred, and the Patient dressed every Day without moving the Foot. Many Circumstances relating to those Diseases have been seen under the general Head of Luxations.

THE

THE THIRD BOOK,

OF THE

Diseases of the Substance of the Bones, and their Articulation.

CHAP. I.

Of the Softness and Curvature of the Bones, or of the Rickets.

I HAVE shown that the Body of the Bones may be deformed in several Ways. First, By Fractures badly reunited, or by Luxation ill reduced, which render the Limb distorted. Secondly, By Curvatures, and different Sorts of Bumps, which disorder the Pieces, that compose the Spine. Thirdly, By the Curvatures that are brought on that same Part; either by some violent Convulsion, or Paralysis of the Muscles serving to those Motions.

It is likewise easy to conceive, that the Bones may be deformed by the Crookedness of the Joints, a Disease I shall speak of in treating of Ankyloses; and in Infancy, where the soft and supple Fibres easily bend in different Directions without fracturing, by the Curvature of their own Body.

The Body of the Bones may be bent in the Uterus, or after Birth, in the Uterus of the Mother by the Power of her Imagination, which affects the Humors of the Fœtus, and which may excite the same Passions in it which she suffers; and it is on Account of these Motions and extraordinary Shocks, that the tender and soft Texture of the Bones of the Fœtus may be disordered variously. These Bones may be likewise bent in the Uterus, as well by Reason of the bad Situation the Mother and Fœtus are in, as by the Violence of some Blow, or Fall,

Fall, she shall have had; or because she laces too tight, in order to hide her Pregnancy; or lastly, by some hard scirrhus Tumor, in the internal or external Part of the Uterus, which compresses and straitens it.

All these violent Shocks, and extraordinary Compressions may easily change the natural Configuration of these small half-formed Limbs, which are only yet like a half congealed Liquor.

But these Disorders are more frequently owing to the Fault of the Midwife, who, in a difficult Labour, handling the tender Parts of the Child too roughly, changes and mars their Figure.

Nurses likewise contribute to this defective Conformation by their bad Manner of swaddling the Infants, or when holding them in their Arms, they press their Thighs and Legs too roughly, or because they leave them too long in a bad Situation, either lying, or standing. It may also happen, when being attack'd with a Disease, they are obliged to remain long in one Posture, to avoid the Pain they would feel, if they changed it; lastly, it sometimes proceeds from the Child's having been put to walk too soon, so that the yet tender and soft Bones have been made to bend under the Weight of the Body.

It is easily conceived, that, in all these Cases, the Bones keep the bad Turn they have taken; and that it is the same with the young Branches of Trees that the Gardiners lay along, and bend in different Directions to form Arbours.

It is easy to judge, by what has been said, that if the Humerus, for Example, or the Femur, of an Infant be bent, that only happens because they being yet tender, are susceptible of the violent Impressions of external Causes, and that this bad Configuration cannot happen to the Bones of Adults, which I suppose in their natural Hardness, if not owing to Fractures badly reunited.

But I do not intend to speak of all the Species of Crookedness, I confine myself to those that happen to the Bones of Children, or to those of Adults, without the Impression of any external Cause. Such are the Curvatures of the Bones of the rickety.

The English call those Children rickety. Glisson, who first described this Disease, searching the Etymology of this Word, says, that an Englishman gave it without thinking of that of Rackitis, which in Greek signifies Disease of the Spine. Those attack'd with it are called in France, *Enfans noués*, because they cannot move, and sometime since the English Word began

gan to be naturalized; so that these poor little Innocents are called rickety.

Some have wrote that that Disease is called in France Chartre; but, besides that that Word is only used to denote the authentic Titles of some Churches, or the Privileges granted to some Province, as that called Chartre Normande; they have confounded these two Diseases which are very different, for it is said, that a Child is en chartre, when it is dry, hectic, and so emaciated, that there is nothing left but Skin and Bone; a Disease to which Physicians have given the Name of Marasmus, and which is very different from the Rickets. Perhaps also the Expression, those Children are en Chartre, is derived from their being devoted to some Saint, whose Shrines are called Chartres by our old Authors.

Glisson, who wrote upon this Disease in 1580, says, that it was first known in the West of England forty Years before, and was from thence spread through the rest of the Kingdom; but it is however less frequent in the western than in the northern Parts. It is very rare in Denmark and Germany. It generally attacks Children five or six Months after Birth, and continues to three Years of Age, frequently enough to five or six; sometimes, but seldom to ten. It is still more rare to see it last to a very advanced Age, or through Life.

In order to find out the Cause of this Disease, it is necessary to be fully informed of all it's attending Symptoms.

The Head of the rickety is larger in Proportion than in other Infants of the same Age, the Face is fuller and plumper than the rest of the Body, and it is agreed that they are much more sensible, and serious than others.

In the rest of the Body, the Skin is loose and wrinkled; because the Fat and Muscles it covers are very soft. Their Abdomen is very large, and greatly distended, because the Liver and Spleen are much more bulky than they ought naturally to be. They are in other Respects very sound. The Stomach and Intestines are greatly inflated, though sound.

The Meseraic Glands are sometimes larger than in their natural State, particularly in those that have any Tendency to a Marasmus; the other abdominal Viscera are sound enough.

The Thorax is contracted, and flattened laterally; which renders it much narrower; those Children have also a very troublesome Respiration, and are always, as it were, out of Breath. For the Lungs are not easily dilated and expanded, as well by Reason of the bad Conformation of the Ribs, as by the Difficulty the Diaphragm finds to become even on Account of the extraordinary Size of the Liver and Spleen. The
Circulation

Circulation of the Blood in the Lungs are impeded, wherefore they are commonly foundered and inflamed, and even scirrhus. Water is likewise frequently enough met with in the Thorax. The Thymus, and Oesophagean Glands, as they are called, are larger than in their natural State, and filled with foreign Humors.

In some of these Children, the Substance of the Brain, and spinal Marrow is in a tolerable sound State; in others it is soft, and Water is found in the Ventricles. All the Muscles are soft, white and discoloured; the Blood is very serous, and greatly dissolved.

But all these Disorders are nothing in Comparison of those that are to be remarked in the Solids.

Indeed the Head of those Infants, as before-mentioned, is always larger than it ought to be in Proportion to their Age.

As the Bones of this Part are tender and soft, like those of the rest of the Body, they more easily yield and obey the Distole of the Brain, so that they stretch out and dilate greatly; whereby the Head becomes of an extraordinary Size. The Clavicles are more bent in Proportion than in other Subjects, and that causes a Species of Tumor to appear at some Distance from the Sternum. The Humerus is bent inwards, as also the Ulna and Radius, which are much more so. The Bones of the Carpus, Metacarpus, and Fingers, are more swelled; whereby the Hands and Wrists of the rickety appear larger than they ought to be in Proportion to their Age. The Femur is naturally a little bent backwards; its Neck is oblique, and its internal Condyle project further than the external; in the Rickets, on the contrary, it is much more bent backwards, its Neck is almost horizontal, and its internal Condyle is even with the external.

The Tibia and Fibula are bent externally. The Tibia does not bear perpendicularly upon the Astragalus; the Knees touch, and the Foot is forced outwards, on Account of the Curvature of the Leg; thus the Feet are greatly removed from the Line of Direction, whence it comes that those Children walk like Ducks, that is, they limp to the right and left.

The Epiphyses are greatly swelled, the Thorax is contracted, and flattened laterally, which renders its Middle more prominent.

At the Junction of the Ribs with the Cartilages, that connect them with the Sternum, they are more swelled, and each forms a Tumor as large as a Filberd. In the rest of their Extent, and chiefly internally they appear full of Wrinkles. They are much closer and larger than in healthy Subjects.

Those Children's Back is arched, that is the Spine is bent forwards, and cannot be erected on Account of the great Weakness of the Muscles, appointed to that Use; this is the Reason why their Neck appears shorter, and almost hid betwixt the Shoulders, which is owing to the great Compression of the Bodies of the Vertebrae by the sinking down of the Head. The Bodies of the other Vertebrae are likewise greatly compressed for the same Reason, particularly towards the lumbar Region, which sometimes makes those Infants gibbous there. In some the Spine resembles the Capital S.

The *Ossa Ilia* are very narrow, being turned inwards, and the *Ossa Pubis* greatly flattened, and pressed against the *Os Sacrum*. All this renders the Pelvis very narrow.

The Substance of those Bones is very much softened, their Surface uneven, scabrous, and covered in various Places with a Stratum of ossific Matter formed by the Extravasation of the nutritive Juices of the Bones. They are spongy, and as it were pierced with many little Holes, from whence by pressing them ever so gently, a sanious Matter is discharged. They are of a greyish and ashcoloured white. These Bones are more thin, light, and tender than those of other Infants of the same Age, this renders them more brittle. They lose somewhat of their natural Figure, because they are swelled, that is, a Bone of a triangular Form becomes round, &c. They are all equally moistened with those bad Juices, that is, they all partake of that preternatural Softness. The carpal, and tarsal Bones are not exempt, as I have remarked above.

In some, Caluses are observed to be formed in Consequence of different incompleat Fractures, for they are too soft to be broken compleatly. The Humerus is more exposed thereto than any other Bone. The Marrow that fills up their Cavity appears more copious and thin.

As Infants are commonly rickety at the Appearance of their first Teeth, and sometimes later, the Shoots of the first, and sometimes those of the second are destroyed, when the Disease lasts long, and few are seen rickety at ten or twelve Years of Age, that are not toothless.

It is surprising to see this Disorder formed, or renewed in an advanced Age, that it sometimes happens, is nevertheless clearly proved by the following Observations.

OBSERVATION I.

THE 8th of March 1690, a Woman about thirty Years of Age came to the Hotel-Dieu, who for four Months had suffered excessive Pains all over her Body, without any Appearance of Fever. She could nevertheless walk, and perform other Motions with sufficient Freedom. Such Remedies were given her as were judged proper to the Disease, and she was observed to be in great Pain upon the least Touch. Three Months after, she was kept in Bed, as she could no longer walk, all her Bones fractured in such a Manner, that she could not be touched without some fresh Fracture, and her Pains increased continually. She remained six Months in this last State, and died the 6th of December of the same Year. She was opened, and the Bones of the Thighs, Legs, Arms, Clavicles, Ribs, Vertebrae, and Iliac were broken. There was not one Bone of her Body free from Fracture. Their Texture was so thin, and tender, that they could not be held, and pressed in the Fingers, but they crumbled into little Pieces, as soft as the wet and rotten Bark of a Tree. They were besides filled with a reddish Marrow. The Bones of the Cranium sunk in under the Fingers, like those of an Infant fifteen Days old. The Muscles were white and flabby, the Cartilages, and Articulations, did not seem changed. The internal Parts were very sound, no Sign in the whole Body of any preceding Disease appeared. This Observation is taken from Saviard.

OBSERVATION II.

A Woman aged twenty seven, had been rickety in her Infancy, and had continued so to thirteen or fourteen Years of Age. At this Time the Bones recovered their natural Hardness, and Solidity, but did not become straight. Generally speaking, the Attack principally falls upon the Extremities.

Besides the Curvature of the inferior Extremities, the Spine described a capital S. This bad Configuration rendered her so little, that she was only three Feet high. The Os Sacrum, and Offa Innominata were very much bent inwards, which made the Cavity of the Pelvis so narrow, that there was not four Fingers Distance from the Os Pubis to the Os Sacrum. She came to the Hotel-Dieu 1697, to lay-in. The Time of her Delivery being come, the extreme Narrowness of the Pelvis would not permit the Child's Exit, and she died in Labour.

OBSERVATION III.

A Young Man, twenty-five, or twenty-six Years of Age, who had been rickety in his Infancy, remained so to about his twelfth Year; then he began to walk, and continued to do so to his twentieth Year. Being then taken ill, he kept his Bed for five or six Months. He had always been sickly. Endeavouring to get out of Bed to go to the Close-Stool, he fractured his Thigh. He was put into Bed again, and a Surgeon was called, who, not imagining that the Bone could be broken by so slight a Motion, treated the Accident as a simple Sprain, and applied some Remedies proper for the supposed Disease.

But as the Patient complained continually, fifteen Days after others were called in, who discovered the Fracture. Nevertheless, though it was badly replaced, they judged it proper to do nothing more by Reason of the Weakness, and bad Habit of the Subject. So he was obliged to remain in Bed five or six Years, by Reason of his mere Inability to walk. At last he was received into one of the Houses of the Hospital General, called Saltpêtrière, where he lived about fifteen Days. One Morning, whilst they made his Bed, though they handled him with all possible Caution, for he was in great Pain upon the least Touch, he complained a-fresh, that the Thigh was fractured. They thought him whimsical, and contented themselves with laying him in as favourable a Situation, as the melancholy State he was in, would permit. But he died five or six Days after, and a second Fracture was really discovered below the first.

If we consider, that the Bones of this young Man began to soften, we shall have no Room to doubt of the Return of the Rickets.

In the Journaux des Sçavans, some Examples of the Softenings of the Bones are related. Fernel in the second Book of his Treatise, *Of hidden Causes of natural Things*, speaks of a Soldier, all whose Bones were as soft as Wax, so that they could be bent in all Directions. Forestus, Zacutus, and Oliger Jacobéus likewise relates similar Facts. There was also a like one at Toulouse. A Woman died in the Hospital of that City, those who opened her, found all her Bones soft.

Let us endeavour to find out the Cause of those extraordinary Accidents, and let us begin by examining the two Systems that have been the most followed to the present Time, without stopping at those, that have been proposed some Years ago, through a mere Affectation of Singularity, and Ostentation of great Learning, perhaps badly enough understood.

Gliffon explains the Crookedness of Bones in the following Manner.

Suppose, says he, a Column of many Stones, placed perpendicularly upon one another. If Wedges are put on one Side only betwixt all their Junctures, the Pillar will certainly form an Arch.

To apply this Comparifon to the Curvature of Bones. This Author fays that if thofe that are long, as the Ulna, Tibia, &c, are nourifhed, and grow more on one Side, than the other, they muft bend on the contrary one, for this Superabundance of Nutriment on one Side, produces the fame Effect in the Crookedness of the Bones, as the Wedges do in Refpect to the Pillar. The only Difference is, that the Wedges being placed in certain Parts of the Column, at a fufficient Difftance from one another, it muft make Angles; whereas the Nutriment that is diftributed more copioufly on one Side than the other, is diffufed equally every where lengthwife; therefore does the Bone bend without making Angles, that is, it represents the Segment of a Circle. Thus reasons the learned Gliffon.

I own I formerly thought this Opinion feemed very probable, and I even endeavoured to fupport it by divers Examples, by explaining why Ears of Corn bend towards the South; why an Oak Plant, two Inches in Diameter, one Side being wet, and the other expofed to the Sun, bends towards the latter; why Parchment, Paper, Bread, bend towards the Fire. I explained that, on all thefe Occafions, the Side expofed to the Sun, or Fire, drying, the Juices that filled up the Pores were exhauled in Part, or in Part repelled into the Spaces of the contrary Side, and that thus the fmall Particles of the Fluid that filled up all the Intervals of the Part, which the Sun or Fire did not reach, were as fo many little Wedges, which feparating and dilating them, forced them to bend on the dried Side.

But fince that Time, I have found out, that that Opinion was clogged with great Difficulties. Indeed, how do we know, that the Bones are nourifhed more on one Side than another? Experience proves that the Blood is diftributed equally through the whole Subftance of thofe, that are thus bent, and a Proof that it likewife nourifhes them equally, is, that if a fine Injection is thrown in, and they are fawn through, the fame Diftribution is apparent in all, and the Bones are as thick in the concave, as in the convex Part, unlefs they be extremely bent. Now in this Cafe, fo far is the unequal Diftribution of the Nutriment from occafioning the Curvature, that it is the Crookedness on the contrary, which caufes that Inequality, by rendering

the Pores of the convex Part larger, and those of the concave narrower.

Mayo proposes another Difficulty against Glisson. If that Bending, says he, depended upon the unequal Distribution of the nutritive Juices, the Posterior Part of the Tibia would be more nourished than the anterior, because it is less exposed to the Cold, as it is covered with several Muscles, so it should be convex backwards and concave forwards, which nevertheless is not observed in that Disease.

This Author, who wrote upon that Disease some Time after Glisson, was desirous of establishing a quite different System. He supposes that, in that Disease, the muscular and tendinous Parts, are no longer nourished, nor grow, on Account of the Deficiency of nervous Juice, which he says is absolutely necessary to that Use, whilst the Bones grow and are nourished in the natural Way. This being granted, he pretends to explain the Curvature of the Bones easily.

When the Tibia, for Instance, begins to grow, and lengthen, the Muscles, that cover it backwards, being unable to yield, and extend, because they do not grow as much as the Bones, the Tibia being thus limited at both Ends, and enlarging continually, must necessarily bend in an Arch.

He confirms his Opinion by the following Experiment. If a Cord is fastened to the Top and Bottom of a young Tree, so as not to hurt it, when it grows, it will certainly bend like a Bow. The same Thing happens to the Bones, whose Ends are held fast by the Muscles attach'd thereto. Mayo adds, that the Bones are always bent on that Side, where the Muscles are placed, in the same Manner as the young Tree is bent on the Side towards the Cord, as is seen in the Tibia. It is therefore true, that the Bones are bent by the Muscles, as a young Tree is bent by the Cord.

It is for that Reason, says he, that Frictions are always applied on the crooked Side of the Bones, and not on their convex Side; for by heating the Part in this Manner, the Pores of the Muscles and Tendons are opened, which occasions a copious Flux of the Nutritive Juices there. We ought not therefore to be surpris'd that if the Muscles should relax and elongate, these Bones become straight, and recover their primitive Figure.

The Spine is bent variously, partly inwards, and partly outwards, which is merely owing to the different Position of the Muscles, that are attach'd to it's different Parts. For Example, the Muscles covering the posterior Part of the Neck, and Back, bend it backwards, and those attach'd to it's internal, as
the

the Psoas, bent it forwards, which gives it the Form of a capital S.

Mayo pretends that it is not only in that Disease that the Bones are thus bent, but that it is general in all those, where the Bones take a bad Figure. Thus during Youth, if any Muscle should dry for want of Nutriment, the Bone must necessarily bend on that Side.

Lastly, he believes, what gives his Opinion it's strongest Confirmation is, that the Femur and Humerus are rarely bent, because they are surrounded with Muscles, that draw them equally on all Sides. But, though that equal Tension prevents them from elongating lengthwise, it permits them nevertheless to enlarge, principally at their Extremities, where the nutritive Juices flow more copiously; and it is for that Reason that large Knots are seen in the Joints. He reasons from the same Principle on the Figure of the Thorax, which is contracted, and prominent in the Rickets.

He again explains in another Manner the Figure of the Thorax, which is contracted and pointed in that Disease. The Ribs, says he, cannot enlarge their Circle, except the intercostal Muscles relax, and elongate at the same Time, but they like the others, cannot stretch out for Want of Nutriment. Nevertheless the Ribs grow continually by Means of the nutritive Juices; they must therefore enlarge, and Knots must be produced at their Extremities, particularly in the sternal ones, which are more tender; but, as that Growth does not answer to the Quantity of Nutriment brought thither, they must be raised into a Point, because they can only grow in that Manner.

He explains by the same Principles the Tuberosities observable at the Carpus, and Tarsus.

Though this System be much more ingenious, and mechanical, than Glisson's, it nevertheless certainly labours under insuperable Difficulties. This I am going to prove by discussing each particular Proof of his Opinion.

First, he supposes that in this Disease the Bones grow, and are nourished in the natural Way: *Afferimus ossa in hoc Affectu non esse numeranda inter Partes affectus respectu nutritionis; illa enim non minus quam in sanis aluntur.* This is the first Principle of that System, which is easily destroyed by the mere Inspection of rickety Bones, as they all certainly have become exceeding soft, and are moistened with very bad Juices.

The second Principle is, that the Tubes of the spinal Marrow are obstructed; whereby the nervous Juice no longer flows into the muscular, and tendinous Parts, which being no longer nourished, dry.

But how are the Tubes of the spinal Marrow known to be obstructed, since Experience teaches us, that there is very frequently no sensible Alteration, neither in the Brain, nor spinal Marrow; and so far are the Muscles from being dried, and the Tendons contracted, as Mayo supposes, that they are on the contrary soft, white, and discoloured, and the Tendons very supple, and greatly elongated? Besides it is not true, that the Bones have the same Growth, as in the natural Way, let them only be sawed through for Satisfaction, and their Texture will be seen to be much thinner in Proportion to the Age of those Children.

These Principles being over-turned, we can easily destroy all the Proofs upon which this System is built.

When the Tibia, says Mayo, begins to grow, the Muscles covering it backwards, being unable to yield and stretch out, because they do not grow as much as the Bones; it being thus confined at both Ends, and increasing continually, must necessarily bend backwards. I may answer that it is not only to the Muscles, that that Curvature ought to be imputed, but likewise to the great Softness of the Bones, which permits them to obey their Tension. Otherwise the Antagonists would only force one another, and the weakest would obey the strongest, rather than bend the Bone; now, in this Case, the Joint only would be bent. It ought moreover to be observed, that Mayo's Comparison is not just, for in order to be so, the Muscle should be attach'd to both Ends of the same Bone, as a Cord is to both Extremities of a young Tree. Now, if there was a Hinge in the middle of that young Tree, the shortening of the Cord would only make it bend there.

Secondly, the Spine, says Mayo, bends variously, and that only proceeds from the different Position of the Muscles attach'd to its different Parts, some of which are entirely relaxed, whilst others are in Contraction.

I answer in the first Place, that we daily see rickety Children, whose Spine is not curved like a capital S, their Back only is very much arched; sometimes only the first lumbar Vertebrae are forced backwards; which makes the Beginning of a Bump. It is true, that in other Cases, the Spine is curved like the capital S. For Example, I have seen a Woman, whose Spine was so distorted, that at twenty seven Years of Age, she was only about three Feet high. But all those bad Conformations of the Spine do not depend upon the Tension of the Muscles, as I am going to prove; and, if that Tension was the Cause of it, the Spine of rickety Children would always be bent backwards; since the Muscles serving to that Use are infinitely stronger than their Antagonists.

Mayo

Mayo has not consider'd that the Figure of the Spine of the rickety is only spoiled when they begin to walk, which proceeds from this, that their Thighs being greatly bent backwards, the Line of Direction no longer passes through the Articulations of the *Ossa Innominata*, and the Foot, which are the common Points of Support to the Body. Consequently they are obliged to walk in the same Manner we do when half bent, that is, they walk like Ducks. Thus the Body has a long Turn to make from the right to the left, and from the left to the right, in passing and repassing one Leg over the other. It is necessary to add, that those Infants erect the Spine with great Difficulty on Account of the Weakness of the Muscles. All these Causes greatly injure the vertebral Cartilages and Ligaments, especially, the last dorsal, and first lumbar ones; from whence the Cartilages swell, and the Viscosities increase there; and this bends the Spine, as I have explained in speaking of Bumps.

Mayo imagines that it is not only in this Disease, that the Bones bend thus, but that it is general in all, that take a bad Turn, from whence he concludes that, if during Youth, any Muscle should dry, for want of Nutriment, the Bone must necessarily bend on that Side.

But the Weakness of that Proof is easily demonstrated, since Children are daily seen, whose Thighs and Legs, remain paralytic several Months, without any super-vening Curvature, and that, when their Muscles dry, and shorten, the whole Bending happens in the Joint only.

He fancies what confirms his Opinion most is, that the femoral, and crural Bones are seldom bent, which he attributes to their being surrounded with Muscles, that draw them equally on all Sides.

But what shows the Falsity of this Reasoning is, that the Femur is always very considerably bent. As for the Humerus, I own it is less so, but it is not because it is equally pulled by its surrounding Muscles, but for other Reasons, which I shall afterwards give.

We only know of these two celebrated Physicians, who have treated of the Rickets. I have shewn that their Systems are clogged with insuperable Difficulties; it is necessary therefore to propose one which agrees with all the above-mentioned Facts. But in order to a clear Comprehension of the Matter, we must first make the following Remarks.

First, that all the Bones are naturally somewhat bent; secondly, that they are all extremely softened in the Rickets; thirdly, that the Muscles surrounding the Bones may be considered like the Cord at the Extremities of a Bow, which will

always perform the Function of a Cord in Respect to that Bow, on what Side soever it is, in Case it be not placed upon the convex Side.

This being granted, when the flexor Muscles of the Ulna, for Instance, which by one Extremity are attach'd towards the Head of the Humerus, and passing over the Joint of the Ulna, proceed to be inserted by the other into it's upper Part, endeavour to contract, if their Antagonists, that is, the Extensors, should resist them more than the Humerus, it must necessarily bend, and as it can more easily do it in the Direction in which it is already curved, than in any other; and moreover since it's strongest Muscles are on that Side, consequently that Curvature must increase in Proportion to the Force of the Muscle, and Softness of the Bone. This being the Case, we have only to examine on what Side the Bones are naturally bent, in order to see on what Side the preternatural Curvature ought to happen.

The Humerus, Ulna, and Radius, are bent inwards in a natural State.

The Femur is bent backwards; The Tibia and Fibula externally.

It follows then, that in the Rickets the preternatural Curvature of every Bone ought to be on the Side of the natural Bending, in what Direction soever it be, and that really is the Case.

Besides the natural Crookedness of the Bones, it is also necessary to remark the Situation of their Epiphyses, for they project, and are turned in most of the Bones on the Side of their natural Bending. For which Reason they are not drawn by the Muscles in a straight Line, according to the Length of the Bone, which would in no wise tend to bend it, no more than a Cord that should run along the Rod of which the Bow is made; but those Muscles passing at a Distance from the Bone, by Reason of the Eminences, which are its Epiphyses, as the Cord passes at a Distance from the Rod of which the Bow is formed, when we have begun to bend it, they must bring those Epiphyses nearer each other, and consequently bend the Bone in the same Manner as the Cord does the Bow.

In order to a clear Explanation, I say that the Use of the elastic Motion of the Muscles which have Antagonists, is by their Contraction to bring the Extremities of the Bones nearer each other; it tends then, either to make the Bone return to itself, or bend, to make it return to itself, if their Direction is according to the Length of the Bone, and to bend it if it is at some Distance. Now the natural Curvature of the Bones, assisted by the Projections of the Epiphyses, which incline to the
same

same Side, turns the Direction of those Muscles on the Side of that Bending; it must therefore be that the Bones being soft and supple, as they are in the Rickets, will bend on the Side of their natural Crookedness, by the elastic Action of the surrounding Muscles.

It will undoubtedly be asked how Bones drawn equally on all Sides, as those articulated by Enarthrosis are, can bend in any Direction.

I answer that in all those Articulations, the Direction of the Muscles is on the Side of their natural Bending, and that it must consequently increase it.

In short, the general Reason why the elastic Action of the opposite Muscles tends to bend the Bone they surround, is that in that Action all their Powers bear upon the Point of Support, that is, upon the Part of the Articulation where the Motion is performed, and then they produce the same Effect as if, instead of acting against one another, they conspired to push this Part of the Joint towards the opposite Extremity of the Bone. Now it is observable, that this Part of the Articulation, as well as the Epiphysis, projects towards the natural Bending; the whole Action of these Muscles then must necessarily be directed from one Extremity of the Bone to the other on the Side of the natural Bending. Wherefore all those Muscles, in what Situation soever they may be must conspire in augmenting this Curvature; for it is sufficient that their common Direction, or that of the Point of Support be on this Side.

But though it should be on the Side of the natural Bending, it would nevertheless tend to bend the Bone on this Side, for it suffices according to the above Principle, that it be not on the convex Side, nor in the Length of the Bone.

Lastly, let a Bone be surrounded with as many Muscles, and place them as you please, they will have no other Action in their Equilibrio than that, which makes the Weight of the Point of Support, nor consequently any other Direction than that of the Point of Support itself; the Business is only then to determine what is the precise Direction of the Point of Support, without regarding, either the Number, Force, or Situation of these Muscles. Nevertheless if they are in a Situation, that favours the Curvature of the Bones, that ought to contribute to it's Augmentation; and this is observed in the Rickets, where they are all placed on the Side of the Bending of the Bones; and though the Humerus be much straighter than the Rest, all the Muscles serving to extend it are likewise placed on the Side of it's Curvature, thus the Flexors, and Extensors contribute to the Disorder.

It

It is remarked that the Humerus is less bent in a natural State, and also in the Rickets than the rest; and it is to supply this Want of Crookedness, that it's Epiphyses project greatly inwards. On the contrary, in the Femur, the natural Bending is very great, and the Epiphyses project more than in the Humerus; it is also for this Reason that it is much more easily bent preternaturally. Indeed Experience proves that the Bending is less discernible in the Humerus than in the Femur.

As for the Leg, it is composed of two Bones of very unequal Strength, and the Weakest is also on the Side of the Curvature; thus it is not surprising, that it increases on that Side, as well because it is already naturally begun there, as because the Bone of this Side yields more easily than that of the other. It is not the same with the Fore-Arm, where both Bones are nearly of equal Strength, and only bent inwards, and not laterally; whereby their Increase of Curvature in the Rickets proceeds only from the Projection of the Epiphyses inwards, and their natural Bending, and as this Arrangement is the same in both, they bend equally in that Direction, and not laterally, as in the Leg.

It is remarked in the Rickets, that the Thorax is greatly flattened laterally, which is undoubtedly owing to this, that the Ribs being very soft, yield easily to the general Action of the intercostal Muscles, which is considered as the Action of one Muscle tending to a straight Line, that should go from the Os Ilii to the Clavicle; this produces the same Effect as a Cord strongly bound, and extended from the Clavicle to the last Rib, which, passing over the Ribs would compress their Middle.

The Ribs thus flattened diminish the Capacity of the Thorax laterally; which forces the Lungs to advance forwards, and push the Sternum outwards to make themselves more Room. The Cartilages in like Manner contribute to that Prominence of the Thorax, for being longer than is necessary to finish the Circle, they not only more easily obey the Expansion of the Lungs, but they also advance forwards. Wherefore rickety Children have the Breast projected forwards, and are called Capon Stomachs; and it's owing to it's Narrowness, that they are, as it were, always out of Breath.

The Ribs thus depressed laterally ought to lose something of their Flexure; nevertheless they receive the same Quantity of Nutriment; it is necessary therefore, that this Overplus, which should have served to the enlarging of their Circles, goes to increase their Breadth, which is sometimes so considerable, that they touch, and unite. This likewise makes them so full of Wrinkles, chiefly internally; and as they are strongly compressed

pressed by the intercostal Muscles, the nutritive Juices, with which they are so plentifully supplied, are forced towards the Ends, and fixing and hardening insensibly there, they produce the Knots that are particularly remarked at the Extremity of the Rib that is joined to the Cartilage, because it is more tender, and more easily spreads out.

As for the Clavicles, which are much more bent than in their natural State, there is Reason to believe, that that is only owing to their great Softness, which, rendering them capable of receiving a great deal of Nutriment, makes them stretch out beyond the Space they have from the Sternum to the Shoulder. Nevertheless, as they must be confined there, they will necessarily be still more bent there, which can be more easily done according to the natural Bending, than in any other Direction.

It is remarked in all those Bones that the Cavity containing the Marrow disappears where they are most bent, which undoubtedly happens, because in bending, the internal Sides come near the external by flattening, as is the Case with a Quill that is bent. Now it is this Narrowness, or the Obstruction of those little bony Canals, which no longer permitting so free a Course to the nutritive Juices with which they are supplied, occasions them to stop there in a larger Quantity, and insensibly fixing there, they fill up the Cavities of the Bones.

The Head of the rickety appears larger than it ought to be in Proportion to their Age; which depends upon the Softness of the Bones of the Cranium, and this makes them more easily yield, and obey the Swelling and Diafole of the Brain, and dilate and enlarge more. Now the Bregma and Junction of the Sagittal and lambdoidal Suture are the most elevated, because they are yet membranous, and consequently are very capable of stretching out.

The Liver and Spleen are not much larger than they ought to be, in Proportion to their Age, except on Account of their extreme Softness, which makes them receive a much more plentiful Nourishment.

In Respect to the bad Conformation of the Spine, it depends upon several Causes; the Weakness of the Spring of the Muscles serving to erect the Spine, the Weight of the Head falling forwards, and especially the bad Attitudes those Children take, when they are obliged to walk; consequently the Vertebrae with their Cartilages and Ligaments are compressed, whereby they are forced sometimes to one, and sometimes to another Side, as I have explained in speaking of Bumps.

It is observed, that the Children attacked with this Disease, support

support themselves with great Difficulty; some pretend this proceeds from the Dryness of their Muscles, and the Defect of the Animal Spirits caused by the Obstruction of the Spinal Marrow.

But without staying any longer to confute that Explanation, it is easily demonstrated to be owing to the Curvature of the crural Bones, which neither allows them to bear perpendicularly upon one another, nor yet permits the Line of Direction of their Bodies to pass through the Articulations of the *Ossa Innominata* and Foot. Nevertheless, the Points of Support of Motion are in these Joints; now, the more that Bone is bent, the more the Line of Direction is removed from these Points of Support; and the more a Weight is removed from the Points of Support, so much the more Force is necessary to sustain it. Thus, Weights being equal, the Muscles serving to keep the Body straight, require so much more Strength, as the Curvatures here spoken of are greater. That is the Reason why those poor Children, who have not any Muscles stronger than others, must be at great Pains to administer, as it were, to the greater Expence of Spirits, which they have occasion for in supporting themselves. They therefore feel the same Difficulties we do, when, instead of keeping ourselves straight, we try to support ourselves half bent. Every one can easily perceive the Difference of these two Situations; and the Reason of it is, that the Weight being farther from the Points of Support, when we are half bent, than when standing, we necessarily require more Force to support ourselves in that, than in the other Posture.

It may be asked why those Infants are much more sensible than others of the same Age. I answer first, that proceeds from the greater Freedom which the Brain has to dilate than in the natural State, the Branches of the carotid and vertebral Arteries with which it is beset, dilate also more. Thus they furnish a greater Quantity of Blood and Spirits, and the Functions of the Head are better performed: Secondly, if we consider that the Conformation of the Legs, joined to the Relaxation of the Muscles, do not allow them to support themselves, and walk but with great Difficulty, it will be easy to judge, that, the Spirits which should be employed in those Motions, being kept within the Head, the Functions of the Memory, Imagination and Organs of Senses, ought to be much better executed.

Rickety Children are in great Pain, especially at first, because all the Bones beginning to swell, separate the Periosteum, which causes it.

My

My Intention is not to give a general History of the Rickets here, nor to search out all the Causes and Symptoms; my only View has been to explain the Symptoms relative to the Subject I treat of, that is, the bad Conformation of the solid Parts. I will only say by the Way that, whatever weakens the Ferments serving to Digestion, and causes too great a Diffipation of the volatile and spirituous Parts of the Blood, and diminishes the Force of it's Fermentation, generally tends to that bad Disposition, by rendering the Blood too serous. For Instance, bad Milk and indigestible Aliments, conduce thereto. That is the Reason, why poor People's Children are very subject to it, and why it is so frequent in the Hospitals. Sometimes, nevertheless, the Children of People of Quality are attack'd with it, either through the Fault of their Parents, or the bad Milk of the Nurses, or by their too delicate and dainty Manner of living.

Children also become rickety in almost all Disorders, where they are in great Pain, as when they cut their Teeth with Difficulty, or when they have been attack'd with a violent Epileptic Fit.

Most of those, that I have seen rickety, have been attacked with it at the Cutting, or Shedding of the first Teeth, which having been difficult made them suffer cruelly.

That the Blood of the rickety is very watry is proved by the State of their Muscles, which are white, soft, and all discoloured. The same Alterations are observable in the Viscera.

It is necessary to add, that the Serosity of the Blood is generally owing to a very acrid Salt, which is perceived by the Surface of all the Bones, which is eroded nearly in the same Manner as if the Bone had been steeped in any corrosive Liquor, or incruited with a very fine Plate of bony friable Matter.

This Disease is very terrible, nevertheless it is not mortal, unless it be joined with a hectic Fever, a Phthisis, an Ascites, a Dropsy of the Thorax, or the Scurvy, &c.

Children are seldom born rickety; but the sooner the Distemper begins, the more dangerous it is. Most of them are not to be cured until the fifth or sixth Year. In those that are very sickly, the Curvatures continue to even ten or twelve Years of Age. The Bones very frequently remain a little bent even to a very advanced Age. The Children that are not cured before the seventh or eighth Year are commonly sickly the Rest of their Life, and the Growth of their Parts, especially the Solids, is diminished. The more the Extremities and other Parts are bent, the more terrible and difficult is the Disease

Disease to be cured. If the rickety become scabby, their Cure will be quicker. The Cavity of the Pelvis of Girls, who have been rickety to eight or ten Years of Age, is generally very narrow, for which Reason their Deliveries are more painful.

Let us now proceed to the Cure of this Disease.

The Belly must be kept open by Clysters and Purgatives. Those of the hydragogue Kind ought to be chosen: For Example, Syrup. Rosar. or Syr. Cichorii comp. cum Flor. Pericæ Mali, & Syr. e Spin. Cervin. They are given alone, or mixed cum Infus. Mann. Cass. vel. Senn. sharpened with the Sal. Vegetab. vel. Tartar. vitriol. Rad. Rhabarb is a very proper Purge for the rickety; as also, Jalap. Scammon. and Mercur. dulc. the whole in a Dose proportioned to the Age of the Children. The Jalap. is mixed with the Sal. Tartar, and the Scammon. with the Mercur. dulc. If we do not choose to mix the Mercur. with the Purgatives, it may be given the Night before the Medicine.

Diaphoretic Ptisans are usefully employed; for Example, Decoct. Rad. Chinæ for common Drink, or a simple Ptisan of Rad. Scorzonæ and some Pulv. Ocul. Cancr. or Rassur. Corn. Cerv. with a little Cinnamon, tied up in a Rag. Aperient Broths are also successfully used. By their Means a Part of the superfluous Lymph. may be evacuated by Urine.

The Remedies that are looked upon as Specifics in this Disease, are Absorbents, Diaphoretics, Cephalics and Aperients.

Such are Rad. Chinæ, Sassafras, Salvia, Rosmarinus; Mentha, Bandana, Filix Mas, et Bacc. Juniper. in Infusion, &c. all the Preparations of Chalybs, Tartar and Castor.

If the Mass of Blood of those poor Children is infected with any Relics of a scorbutic, venereal or scrofulous Virus, communicated by the Parents, the Specifics of those Diseases must be joined to those Remedies.

Powders that can blunt the Acrimony of the Lymph, and absorb the superfluous Humours, are likewise greatly recommended.

In this View we employ Pulv. Milleped. Pulv. Lumbricor, Ocul. Caner.-Margarit.-Coral.-Cortic. peruvian.-Cicer.-Corn. Cerv. prepared without Fire, Pulv. Succin.-Antimon. diaphoretic. For Instance, R. Pulv. Ocul. Caner. ʒss Pulv. Corn. Cervin. ppt. sine Igne, ʒj. Pulv. Gum. Myrrh. elect. gr. vj. vel viij. Ol. Anis. dulc. gtt. v. vel vj. m. f. Pulvis, which is to be given at several Doses.

To animate the Ferments of the Parts, that assist Nutrition, Elix. Proprietat. prepared without Acids, or Tinct. Myrrh. and Tinct.

Tinct. Oliban. are used. Some Drops of Aq. flor. Orang. vel Aq. Meliss. are mixed therewith. Confect. Alkerm. is likewise employed. Flor. Sal. Ammoniac, called *Ens Veneris*, are greatly cried up. These Flowers are impregnated with some Particles of Cyprus Vitriol. Sal. Vol. vip. Sal. Vol. Corn. Cerv. are of great Service. Vesicatories and Cauteries are very proper to drain the Mass of Blood of the Lymph, that too abundantly moistens the Viscera, especially the bony Parts.

Mayo speaks thus: *Ad superfluam Cerebri serositatem evacuandam, item ad nimiam Spinalis Medullæ humiditatem resiccandam.* The Nape of the Neck is the most favourable Place for the Cautey.

Sweats are very frequent in this Disease, which are very beneficial, when critical and moderate; but, if they are too copious, they weaken. Wherefore, Part of this Lymph must be carried off by Stool, which may be effected by the frequent Use of Rhubarb.

If we would prevent the Increase of the preternatural Curvature of the Arms, Legs and Spine of the rickety, they must, if possible, be kept in Bed in an almost horizontal Situation; for, as the Pieces composing the inferior Extremities do not bear perpendicularly no more than those of the Spine, the more these poor Infants are forced to walk, the more will those Pieces be disordered.

As for the Arms, it is certain that their bad Configuration is greatly increased by the bad Attitude they are obliged to put them into at every Step they take, by turning and throwing them backwards. All this agrees with Experience, which teaches us, that Children, who have not yet walked, or walk little, have those Parts less deformed.

When we are obliged to rectify the inferior Extremities, we use Boots of Leather, or Steel lined within. If the Shape is spoiled, all the Means proposed for Bumps must be employed; and it is to be remembered, that nothing is so successful, as Frictions and Unctions along the Spine, Arms, Thighs, and even upon the whole Abdomen. The Frictions must be made with warm Linen, the Unctions with Medull. Cervin. sharpened with Ol. Lumbricor.—Ol. Lacert. or Ol. Vulp. or with Adep. human prepared with aromatic Plants. Warm Baths and mineral sulphureous Waters are also serviceable.

Lastly, a Regimen quite contrary to the Nature of the Blood must be prescribed, that is, a Regimen, that tends to dry up the superfluous Humors, and thickens the nutritive Juices; for Instance, Panado, Rice and Barley Creams. By these Means the Blood will be restored to its natural Fermentation,

mentation, the nutritive Juices of the Bones will recover their Consistence, the Muscles their Spring, and the Bones their Hardness and natural Figure.

Rickety Children have frequently been cured by the mere Strength of Nature, without the Assistance of any Remedy.

Nothing more remains but to explain in what Manner the Bones can be rectified, which is the most difficult Part I have to treat of.

In order to succeed therein, it is necessary to remark, that the Softness of the Bones has only been occasioned by some Disorder of the insensible Parts of the bony Fibres, and that even this Disorder is only owing to the nutritive Juices of the Bones, which have been rendered too thin, and penetrating enough to pervade them in all Directions, and break the Connections of their Parts. It is then to the too great Thinness of those Juices, that that Softness ought to be attributed.

The Parts of the Bones would remain thus disordered, that is, in Positions contrary to their natural State, if nothing hindered it, as they would have remained in their first State without the too great Thinness and Acrimony of those Juices. It suffices then, in order to the Recovery of their first Hardness, that they be no longer pervaded by those same Juices.

In order to which, there is nothing to be done, but to render them thicker and less penetrating, and to prevent them from pervading the Cells and fibrous Parts of the Bones, and continuing to disorder them, for as they must flow continually, they will necessarily be obliged to take other Courses, than those interrupted Ways, and consequently re-enter into their natural Passages, that is, into the small bony Pipes parallel to the Length of the Bone, which those acrid and penetrating Juices, had abandoned; and that is the Reason why those Canals, which are yet tender, are obliged to restore themselves in order to allow a free Passage to this new Juice, in like Manner nearly as we conceive a subtle Matter to re-open the Pores of folded Bodies, and produce their Spring, by rectifying them.

In order to a clearer Conception of what I have said above, it is necessary to suppose the Bone like a Bundle of many little Tubes, each of which is weak enough to let itself be restored by the Flux of those new Juices, and which, altogether, are sufficiently strong to make a firm Bone, such as it is after the Cure.

It at first seems strange, that a Motion so weak as that of each Particle of this Juice can produce so great an Effect; but our Surprise will cease, when we consider that the Particles of
Water,

Water, as weak as their Motion is, are capable, by insinuating themselves into the Pores of a Cord, of raising a Weight as heavy as that of a Mill Stone.

When the Rickets have arrived to the last Stage, though the nutritive Juices are re-established, and the Bone recovers it's natural Hardness, the Curvatures have been so great, and the Muscles so disordered, that the Bones can no more be rectified.

CHAP. II.

Of the Softness of the Bones, and what renders them brittle.

WHEN we consider, that most of the Bones of Infants are composed of tender, supple, membranous Fibres, it is easy to explain on what their Softness depends; but how to conceive, that those Fibres, which are hardened with Age, and have acquired the last Degree of Solidity, can become tender and soft as they were before, is the Difficulty? This, however, is what must be explained. In order to which, I will make some Remarks, which seem to me very useful for the Explanation of this Phenomenon.

First, we have seen, that a French Physician, called Papin, has invented a Machine, in which the hardest Bones soften instant'y. It's whole Art consists in compressing the small Particles of hot Water it contains. For, a hot compressed Fluid, being denser, can act by a greater Number of Parts than a rare Body of the same Bulk and Size; whence it more quickly heats the Body it touches. That Water thus compressed, being obliged to pass and repass through the Texture of the Bone, shakes and agitates it's Fibres, and gradually disengages them from one another. Those small Particles of Water, whose Force has been already increased by the Compression, become still more active and penetrating, because they are replete with the Salts, with which the Texture of the Bone is impregnated; this renders them capable of lacerating some of those Fibres, and of breaking their Union in such a Manner, that they change the Texture of the Bone into a Kind of Jelly.

When the Water of the Machine is left at Liberty, it only acts upon the Surface of the Bone, and does not soften it.

This Example shows, that a Bone, how hard soever it is, may soon soften in very pure Water.

308 OF THE SOFTNESS OF THE BONES.

Secondly, the Bones of Hog's Feet, being macerated, become so tender, that they may be eaten. This is seen in that Preparation called Feet a la Sainte-Menehould.

Thirdly, Horn, which comes very near to the Hardness of Bone, softens in warm Water; and the Horn of Animals, that feed in marshy Places is so soft, that it cannot be used in any Work; whereas, that of Animals, that feed and walk in dry and stony Places, is firm, hard and solid. Horn softens as easily when it is steeped in Oil.

Fourthly, there is a very near Affinity between the Tendons, Cartilages and Bones, since most of the Cartilages become bony by Age: Now we know, that if they are macerated some Time in warm Water, they soon soften, and change into a Kind of Glue.

Fifthly, the Branches of Trees, which are very hard and solid in the Winter, soften and become tender at the Appearance of the Spring, when they are moistened with a new Sap; and when the Rains continue long, Corn and Plants become so tender, that the least Blast of Wind lays them.

All these Examples prove, that the Bones, and many other hard and solid Bodies like them, soften in Water, particularly if it is warm, and if they are kept some Time therein in Maceration. They are affected in the same Manner by Oil.

We may therefore presume that, if the Marrow and nutritive Juices of the Bones become very watry, copious and replete, with a Salt like Sal Ammoniac, the Bones must necessarily soften.

Those watry, subtile and penetrating Juices, produce the same Effect in Bones as in Trees and Horns, &c. They insinuate into all the remotest Cells of the Bones, and, by filling them, they separate their Filaments, which remain blended together; and, as they are sharpened with some saline Parts, they gradually disunite the solid Parts, which makes the Bone soften. The Softness is increased by the Alteration of the Marrow, which is much more thin and copious than it ought to be, as Experience proves; this makes it easy for it to insinuate itself into all the Interstices of the Fibres of the Bones, of loosening their Texture, and disposing them, by weakening their Spring, to bend more easily without breaking.

We have a very singular Example of the Softness of the Bones in a Girl, who was brought to the Hotel-Dieu. She was attacked with a Species of Rachitis. If the Softness had been equally diffused in the whole Body of the Bones, instead of fracturing, they would have been simply bent in the same Direction they are in rickety Children; but, as there were Places in

in the same Bone, that had preserved some Hardness, whilst the others were entirely softened, we ought not to be surpris'd, that, if upon the least Force or Compression, the Bone fractured there, whilst the other yielded by Reason of it's Softness.

If we should see a Patient in such an unhappy Case, the certain Means of relieving him would be to clear the primæ Viæ by a Dose of emetic Tartar, provided his Strength would permit; if not, he should be purged with Mercur. dulc. Resin. Jalap. and Ref. Scammon. This Purgative must be frequently repeated. The Ptisans are to be made with Rad. Chinæ. Rad. Sarsaparil. and Sassafras.

Lixivial Salts, and all Medicines called Absorbents, contribute much to the Cure of this Disorder. Such are Bacc. Junip. Sal. Tamarisc. Tinct. Tart. vel Tinct. Chalyb. Ocul. Cancr. Coral. Antimon. diaphoretic. Pulv. Viper, &c.

Amongst the Topics, Vesicatories and the Seton, are very useful; but above all, nothing is more beneficial than Frictions with Fat sharpened with aromatic Plants, and those that are simply made with warm Linen, wherewith the Arms, Thighs and the whole Spine is rubbed.

It has been shown above, that the Bones may be soft, not only in Children, but also in Adults; let us now explain how the Bones, that ought to be very hard in Adults, sometimes break like Glass. Indeed, it has been often seen, that some Bones are easily fractured, and without any Violence being done them.

Many Observations have been made upon this Subject by People of great Veracity. Some are related by Fabricius Hildanus. Some in endeavouring to take the Chamber Pot, others in lifting up their Arms to take a Shirt, have caused Fractures.

What generally renders the Bones brittle is, that their Parts are so disunited, as only to touch in few Points of their Surface; this occasions them to separate entirely from one another, let them be ever so little removed. This Brittleness may be produced in the Bones by their extreme Dryness, which depends upon three Causes, the Want of Nutriment, the Deficiency of the Marrow, and the Action of corrosive Salts.

It is very conceivable how, by the Want of Nutriment, all the Moisture in the Texture of the Bone may transpire insensibly by the Heat of the neighbouring Parts, and that in evaporating it may separate some Parcels of the Bone, and carry off their connecting Juices; this renders it very dry and porous.

310 OF THE SOFTNESS OF THE BONES.

In order to a clear Understanding, how the Marrow being wasted, the Bones become brittle, we are to recollect, that the oily Juices of the Marrow, insinuating amongst the bony Fibres, soften them by it's unctuous Consistence; which renders them more supple and flexible, and consequently less subject to be broken; and I have said that Artificers daily imitated that Process of Nature by boiling in Oil Wood, that they would render very supple.

It is reasonable therefore to believe, that the Marrow being wasted, and the Fibres moreover being but slightly united on Account of the Want of Nourishment, the Bones, though very hard, may fracture easily, without any great Violence offered to them. This Experience shows us in the Bones of Lobsters and Cray Fish, which are very friable and brittle, and we know that the Bones of old People, where the Marrow is greatly diminished, are much more brittle than those of young People.

But, if besides the Deficiency of the Marrow and nutritive Juices, the Mass of Blood furnishes very corrosive and penetrating Salts, it cannot be doubted, that, by passing and repassing through the Texture of the Bone, they must break some of it's Parts and carry them off, and open the Pores to the most hidden Juices, by calcining in some Sort the whole Substance of the Bone. It is for this Reason, that the Surface of these Bones is uneven and scabrous, like that of Bones steeped in Aq. fortis. I have even remarked, that they are lighter than those of healthy People of the same Age. Lastly, they are dry, friable and brittle, like Bones that have been many Years exposed to the Air in the Fields. Those Alterations are observ'd in the Bones of some verolic, and particularly scorbutic People; nevertheless, the same Thing sometimes happens to those who have never been attacked with either Disease.

Sometimes in a Caries, that is internal and free from Pain, because it has not yet reached the Periosteum, there only remains a very thin Plate of Bone that is sound; wherefore, it fractures there by the least Force, those to whom that Accident happens not being able to foresee it. The Example I have related after Paré is a Proof of it.

All these Changes may be explained by those, that happen to Trees. Indeed, their Branches become brittle in Winter on Account of the Want of Sap, and the Transpiration of many watry Particles, and of some of their solid Parts. It very frequently happens, that the Heart being carious, the Bark remaining entire, the Tree is broken by the least Breath of Wind.

It may be asked why Bones fracture more easily and commonly in Winter than in Summer; the most natural Reason is, that the Pavement being covered with a glazed Frost, our Falls are more frequent and violent; thus it is not surprizing if the Bone breaks. Some have pretended, that the Bones fracture more easily in Winter than in Summer, for the same Reason that Trees and Stones split; but I might assert, that in the great Colds the Circulation may be abated; and that the Marrow, serving as a Vehicle to all the bony Fibres, has not the same Fluidity as in Summer, which occasions them to become more rigid and brittle.

It will not be useless to say a Word of the Cliquetis of Bones.

The Cliquetis, which is sometimes heard in the Motion of the Limbs, depends either upon the Dryness of the Joints, owing to the Dissipation of the Liquor that lubricates them, or upon the Attrition of the Bones against the Ligaments, as happens when the Joint is suddenly extended, or upon the violent Extensions of it's surrounding Ligaments and Tendons, whose quick and sudden Return obliges the Bones to rub hard against one another, as is remarked, when any of the Fingers are suddenly bent.

The Cliquetis is heard by some, after the Foot is violently extended, and is suddenly bent; and by others, after the Knee is bent, and is suddenly extended.

C H A P. III.

Of the Ankylosis.

ALthough the Word Ankylosis properly signifies only the Disease, where the Heads and Cavities of articulated Bones are preternaturally united in any Position whatsoever, so that they make but one Piece, which forms an Angle; nevertheless, I include under this Term all the Disorders, that keep the Joints stiff, and render them immovable. For Example, when the Synovia, that lubricates the Cavity of the Joint, becoming too viscous, glues the articulated Extremities close together, I shall call that Disease Ankylosis. When the Cavity of a Joint, or the Tendons and Ligaments that embrace it, are swelled by an extraneous Lymph, or a viscous Humor, I shall also call it Ankylosis. And so likewise when, by the Fracture of any Joint, the nutritive Juice of the Bones extra-

vasating betwixt the Heads and Cavities composing it, cements and unites them immediately.

We hence see that most of these Diseases are called Ankyloses, though they be not accompanied with the Curvature of the Joints, as the Etymology of the Word requires, and, according to the Idea of the Greeks, who invented it, and that this Name is only given them, because they keep the Joints stiff, and disable them.

As most of those Diseases depend upon the Fault of the Synovia, that a just Idea may be given of it, it is proper to understand fully it's Sources, Uses and particular Quality.

The articular Parts of the Bones, being hard and dry, would easily fracture and wear by their mutual Attrition; for which Reason they are covered with Cartilages, which, by their Suppleness, resist the Shocks, that might break them, and by their polished Surface they render the Outsides slippery, and make the Heads of the Bones move easily upon one another; and, as this Polish would be destroyed if the Cartilages should crack through the Dryness and Heat of the Joint, the articulated Heads and Cavities are provided with a viscid Humor, that moistens the Cartilages, and lubricates all the Parts that rub against one another.

The same Device is made Use of in Art; for, in order to prevent the Hardness of Stones from breaking one another, when pressed and squeezed by the enormous Weight of Edifices, Plates of Lead or Mortar are placed betwixt each Stone; and in Machines, where there is much Friction, little Vessels full of Oil are placed, which, to diminish it, flow by little and little to the Places where the Attrition is performed, by filling up their small Inequalities.

The Glands, that furnish this Liquor, have a peculiar Structure. They are composed of Filaments, that interlace and form a Species of Net-work, whose Mashs are of the most exquisite Contexture, which is beset with an infinite Number of little Vesicles, that communicate with one another. They are like those of the Marrow, which they only differ from by their Transparency and Smallness. Their Orifices must be extremely small and strait, since they cannot be perceived. Their Figure varies greatly in most of the Joints. Some resemble a Cone, others a Nipple, and others a Tongue; and all terminate in a very fine small Point, which, in the Flexion and Extension of the Limbs, that is, whilst they are compressed, is always turned to the Cavity of the Articulations. The Extremities of some are unravelled, and appear, as it were, fringed; and the Places, that are very thin, are much redder than

than the Rest of the Gland, by Reason of the great Number of Vessels with which they are beset. The Ends of some are rounded. Some are composed of many Lobes placed upon one another, but they do not seem to be made up of Lobules. Lastly, their Bases are always larger than their Extremities. Some are only composed of close Filaments of Glands. By all these various Configurations, they can better accommodate themselves to the different Places they must occupy in the Joints. Indeed, their Situation varies much.

In the Thigh Joint, the mucilaginous Gland is placed round the Ligament, that attaches the Head of the Bone to the Acetabulum, so that it is entirely covered by it.

In the Knee, there is a very considerable one above the Rotula, the inferior one is less. It's Sides are likewise provided therewith, as also the crucial Ligaments.

In the Joint of the Arm, those Glands are placed at the Sides of the Neck of the Scapula. In the Elbow, the principal are at the posterior Part of the Joint, and between the Ulna and Radius. In the Articulation of the Jaw, they are fixed round the Root of the Ligaments. The same obtains in the Wrist, &c.

As the articulated Extremities leave little Spaces between them, there they are placed; and, when there is any Depression or Sinus, they are lodged in them; thus they are never met with in Parts, where the Heads of the Bones have the greatest Friction. Their Situation is such, that they can only be compressed in the Flexions and Extensions of the Limbs, which is sufficient to squeeze out the Liquor stored up there. As their Orifices are very strait, and even oblique, and the Liquor laid up there is very glutinous, it is easy to conceive, that it cannot issue out but by Means of the Compression.

It is also necessary to give a slight Knowledge of the State of the Muscles and Tendons, as they relate to the Joints.

Besides the Ligaments, the Tendons of the Muscles, that commonly surround the Joint, are like so many Cords, that serve to keep the Head of the Bone in it's Cavity.

In every Joint some Muscles are stronger than others, and they overcome their Antagonists. In the Arm the Extensors, in the Fore-Arm the Flexors, &c. which occasions our Limbs when left to the simple Equilibrio of the Muscles always to keep in a certain Attitude; which is apparent when we are negligently in Bed during Sleep. Then the Arm is a little extended, the Elbow slightly bent, the Radius a little turned inwards, the Fingers, Thigh and Leg gently bent, and the Foot extended.

All the Tendons that pass over the Articulation of the Wrist and Foot, have particular Sheaths, in which they slide, as the Head of a Bone slides in the Cavity, that receives it. Within them, at small Distances, there are mucilaginous Glands, and Collections of Fat, that furnish a Liquor similar to the Synovia, which continually moistens the Sheath and Tendon, which occasions it to slide more easily therein.

The Joints of the Wrist and Foot are provided with a greater Number of those Sheaths than the rest, because over them pass not only the Tendons serving to their Motion, but also all those designed to move the Thumb and Fingers, whereas in the other Joints there are only the Muscles, that serve to move them.

The Elbow and Knee are provided with large Aponeuroses, thus they require to be moistened with a very large Quantity of this Liquor.

When the Limbs are still, those Glands, which are then under no Compression, cannot emit it; it being of a glutinous Nature, and requiring to be forced out; but, if Animals have walked some Days, a great Quantity of it is found in the Articulations, and it flows copiously as soon as they are punctured. The Liquor, they secrete, is clear, inodorous, mucilaginous and brackish; and, though it resembles the White of an Egg, it is much thinner; when it is put upon the Fire, it gradually evaporates almost to nothing, and only leaves a very thin Film; whereas the White of an Egg soon coagulates almost entirely. The Butchers call it Beet-Drop, and in order to collect it, they puncture the Sides of the Joints immediately after the Beast is killed.

I have tried to imitate the Composition of this Liquor, by mixing Ol. Olivar. with several Alkalies, as Sp. Sal. Ammon. Aq. Calc. & Ol. Tarta. but all these Mixtures have only produced saponaceous Matters, that were more or less thin, and I have not been able to meet with any that came near to it's Nature and Consistence.

Amongst the Gums, Gum Arabic approaches it the nearest; for, being dissolved in Water, it makes a Mucilage nearly similar to that of the Joints, and they only differ from each other in the Composition. In the Mucilage of the Joints there are more Particles of Water, and fewer of Earth, in that of Gum Arabic there is less Phlegm, and more Earth.

Some English Authors have imagined, that the Oil of the Marrow oozed through the Pores of the articulated Heads and Cavities, and that mixing with their mucilaginous Lymph, it rendered it more proper for the Uses to which it is appointed,

ed, because this Oil tempering, and diluting this Lymph, prevents it from thickening, and hardening so quickly.

But it is difficult to demonstrate through what Passages the Oil of the Marrow can be carried into the Cavity of the Joints, and how it can pervade the Cartilage, that covers the articulated Heads and Cavities. Besides, that Mixture seems impossible, because those two Liquors cannot mix, as I have experienced. Finally, it's natural Fluidity is sufficiently preserved by the Motions of the Joints.

I have made many Experiments at different Times, by mixing it with Acet. distil. Sp. Vitriol, & Sp. Sulphur. and I have always observed, that by those Mixtures, it coagulated more or less without any Fermentation, and became whiter, especially by mixing Sp. Vitriol. On the contrary, when I mixed it with Sp. Sal. Ammoniac, or with Ol. Tartar. it became more liquid, and clearer. When I mixed it with Sp. Vin. it made it a little muddy, and some Filaments were visible, which dissolved insensibly.

Some Utility may be drawn from those Experiments. If we reflect, for Instance, upon the first Mixtures made with different Acids, we shall know, that nothing is more capable of thickening this Liquor, and increasing it's Consistence than those Kinds of Salts; thus, when we perceive, that it forms Tumors in any Joint, we may with good Reason suppose, that some foreign Acid is mixed with it.

If we pay any Attention to the second Experiments, we shall see, that nothing is more proper to preserve that Liquor in it's natural Thinness, than volatile alkaline Salts. It's Nature being well known, let us give a particular Account of the Diseases, that depend upon it's different Alterations.

The first Species of Ankylosis I have mentioned, is commonly the Consequence of long Diseases, as Fractures, Luxations, and particularly such as have been badly reduced, Aneurisms, and Abscesses of long Continuance.

In the Aneurism, and in the Fracture, and Luxations of the Arm, and Fore-Arm, where the Elbow remains bent during the whole Treatment, the Flexor Tendons contract, and shorten, and the Synovia inspissates, and hardens more or less in Proportion to the Continuance of the Disease. That is the Reason why the Elbow remains bent, and immovable after the Cure.

In the Fractures and Luxations of the Thigh, Leg, and Foot, where the Knee remains extended, and inactive, during the whole Treatment, it's Articulation becomes stiff, and almost immovable, and the Foot extended, whereby
after

after the Cure the Patients can only walk upon their Toes. Those two Accidents are likewise owing to the Inaction of the Part, which has allowed the Synovia of the Knee-Joint to thicken, and the Tendo Achillis to shorten extremely.

In order to discover clearly the Cause, that can produce so many Changes in the Fibres of the Muscles, and Synovia, it is necessary to recollect, that Exercise is of great Service to preserve the Thinness of the Fluids, and facilitate the Distribution of the nutritive Juices, and Spirits, that Exercise is effected by the Contraction, and Relaxation of the Muscles, by the Flexion and Extension of the Limbs; that the Contraction of the Muscles is partly owing to their elastic Quality, and partly to the Influx of Spirits; that the strong Contractions of the Muscles in the different Exercises of the Limbs compress the Vessels, and consequently that their contained Fluids must be more agitated, which contributes to their Thinness by the Attenuation of their Particles, and to their Distribution by the fresh Impulse they receive, and those are redoubled Forces, which rendering the Trituration more exact, and the Circulation freer, likewise make the Transpiration more copious; that by those Means the Parts are better nourished, and that their Fibres being agitated more, consequently become more firm, consistent and elastic.

That is the Reason, why the right Arm is more robust than the left; that in Proportion as Animals ought to have a more plentiful Nutriment, Nature has given them more Desire for Motion, as is seen in Children, and all young Animals, who love to run and leap, because they want more Nourishment. Lastly, from thence proceeds the great Utility of the Gymnastic.

We must not be surprized therefore, that, if the Elbow, for Instance, remain bent for some Weeks, the fleshy Fibres of the flexor Muscles, and their Tendons remain stiff, since the Juices that moisten them may thicken by the rest, and Inaction of the Part, and that, whilst their thinnest Parts evaporate, the Pores of the fleshy and tendinous Fibres are filled more and more with the grosser Particles. It is therefore true, that the Stiffness which seizes upon the Muscles and Tendons at that Time, is not an Effect of the Inaction of their Fibres, or their Relaxation, but rather of a forced Obstruction, of a Convulsion by Repletion, conformable to Hippocrates's Notion. Besides, by the Inaction of the Part, the mucilaginous Liquor, that moistens the Ligaments and Heads of the articulated Bones, inspissates and hardens, which must increase their Stiffness, and prevent the Play of the Joint.

It is evident from what I have said above, that in all Cases, where the Parts must remain five or six Weeks in one Situation, it is of great Consequence to oblige the Patients to move them gently from Time to Time, principally towards the End of the Treatment, to preserve the Suppleness of the Tendons, and Fluidity of the Synovia. But if through Necessity, or Negligence of the Patient or Surgeon, or on Account of the Use of astringent, and drying Remedies, the Tendons should harden, and the Synovia coagulate, the Joint would remain bent, or extended, according to the Situation of the injured Part, and according as it shall have been left to the simple Equilibrio of the Muscles.

As the first Species of Ankylosis is owing to the mere Repose of the Part, I will call it Ankylosis by Inaction. It affords us a manifest Proof of the Utility of Exercise, and the Gymnastic, without which the Fibres become so indolent, and their Oscillations so slow and tardy, that they are no longer proper for the Functions of Life.

In the second Species of Ankylosis, the Liquor furnished by the mucilaginous Glands is so thick and copious, that it entirely fills up the Joint. When it is hardened, the Viscosities make a Noise as if Parchment was rubbed. The Liquor, that serves to lubricate the Tendons, have also acquired a very thick Consistence, their Sheaths are greatly distended. I shall call this second Species a viscid Ankylosis. Let us endeavour to find out the Source of those Viscosities.

Whilst the Organs, and Lymph, that serve to Digestion, are in their natural State, and the Aliments with which we are nourished afford a good Juice of easy Digestion, and the Quantity we take in, is proportioned to that of the Juices, that must penetrate and soften them, and to the Force of the Organs, that are to break them down, they digest perfectly, the Chyle is soft, balsamic, homogeneous, perfectly fluid; in short, such as is proper for all the Functions of Life, but if any of those Qualities are wanting, the Digestion must necessarily be irregular and altered.

Those Viscosities may be produced by the Fault of the Aliments; for the Chyle is nothing else but the Aliments reduced into a Kind of Liquor, and therefore must retain the Character of those of which it is formed. If they are indigestible, the Parts that elude the Action of the Stomach, and its Fibres, must remain half digested, and degenerate into Crudities. If they are tough, and mucilaginous, the Chyle will also be so. It is for that Reason, why Vegetables, Salt, and clammy Meats, crude

crude Fruits, very acid Wines, Milk, Cheese, Chestnuts, produce such Viscidities.

They may also be owing to the Fault of the Organs, that serve to break down the Aliments, and to that of the Juices, whose Office it is to dilute, penetrate, and dissolve them.

If the Spring of the Stomach is too sluggish, and weak, that is, if the Contractions of it's fleshy Fibres be indolent, and slow, and if the Succus gastricus be deprived of it's smart and sharp Parts proper to penetrate the Aliments, and assist to the Dis-union of the component Particles, it is obvious, that the Chyle will remain, crude, viscid, and sour.

What I have said above is confirmed by the Experience of those who live upon such like Aliments, and those that lead a sedentary Life, as all Artificers who work sitting, and especially Weavers, who work in Cellars. The Phlegmatic, Cachetic, Scrofulous, Rheumatic, are commonly attacked with such like Ankyloses; as also Plumbers and Miners. What has been said of the Stomach ought to be applied to the Intestines.

The Viscidities are produced in the primæ Viæ in the following Manner, and it is even easy to conceive, that they must collect there, because they are not dissolved sufficiently to pass into the Lacteals, and they are too glutinous to pass off with the Fœces.

When any Portion of those Viscosities is dissolved, it passes along with the Chyle into the Blood, and nothing so much retards their Dissolution, as over-eating, and Idleness. For, as the Stomach is always full, it's Fibres are too much extended to break down the Aliments easily, and the Juices, that are secreted, are not sufficient to dissolve them, thus so far are the old Viscidities from being evacuated, that fresh ones are continually formed. On the contrary, nothing is so proper to quicken that Dissolution, as a Regimen, and Exercise, and thus it is, that perfect Health may be preserved, according to this Precept, *Non satiari Cibis, & impigrum esse ad Laborem.*

When those viscid Particles are got into the Blood, they join with some particular Humor, with which they have the most Affinity, which then undergoes a faulty Alteration, whilst the rest of the Blood and Humors is preserved from it. Now the Humor the most homogeneous to them is the Synovia, it will therefore be changed by this Mixture, and what will make it fix in some Part, will be the Contusion of some Joint, a Fluxion, a neglected, or ill-treated Luxation, and there the Humor will settle. Then the Ligaments and Tendons are so swelled, that the whole Joint is raised up by it, and it's Motion diminishing in Proportion as it is filled up with those Viscosities that

that Inaction occasions them to thicken from Day to Day, which happens so much the more easily, as the thinnest Part transpires through the Pores of the Joint, and as the thickest is no longer dissolved by it's Motion.

This Species of Ankylosis is of a much more difficult Cure than the first, because it is occasioned by the Fault of the Fluids, which is almost always joined to the bad State of the Joint.

In the third Species of Ankylosis, the Knee, for Example, is greatly swelled, the Tendons, and Ligaments are likewise very much relaxed, and oedematous, and the Lymph within the Joint raises it up.

This Species of Ankylosis ought to be considered as a Dropsy of the Joint.

In order to understand it's Causes, it is necessary to know, that the Waters forming the Dropsy are either infiltrated, or extravasated.

The Parts proper to imbibe Water are the Skin, Membrana adiposa, the Membranes, the Brain, the spinal Marrow, the Marrow of the Bones, &c. The Places proper to receive the Lymph, which flows out of it's Vessels are all large and small Cavities.

For Instance, Dropsies are seen in the Ventricles of the Brain, in the Thorax, in the Pericardium, they are met with in the Abdomen, which is owing to an Extravasation of Lymph in it's Capacity, or in some of it's contained Parts, as in the Uterus, in the Tubæ Fallopiæ, in the Ovaria, in the Kidneys, in the Tunica Vaginalis, that includes the Spermatic Cord, or in that of the Testicle, in the Epiploon; lastly, they form in the Cavities of the Extremities, that is, in the Joints.

In this Species of Dropsy, the Waters may be infiltrated in the Membranes and Ligaments of the Parts, that surround the Joint, and extravasated at the same Time in it's Cavity, as is frequently the Case in the Hydrocele, where there is a Dropsy in the Scrotum by Infiltration, and a Dropsy in the Tunica Vaginalis by Extravasation. In the Dropsy of the Joint, the Sheaths of the Tendons and Ligaments are swelled, glistening, and oedematous; and when the Joint is pressed on with the Finger, the Mark, or Depression remains, the Joint is extremely distended, and its Cavity greatly dilated.

It is certain, that the Dropsies of the Ventricles of the Brain, spinal Marrow, Pericardium, Periosteum, Peritonæum, Tunica vaginalis, are only owing to the Relaxation of their Glands, and consequently there can be no Doubt, that the Dropsy of the Joints is also owing to the Relaxation of the mucilaginous Glands.

This

This Relaxation is occasioned, either by frequent Contusions, Sprains, Fluxions, or by Cold.

When their Orifices are relaxed, and have lost that Spring, which commonly preserves them in a certain State of Force, and Tension, then they are no longer able to regulate the Course of the Fluids. Besides, that Juice, which in it's natural State is so glutinous, that it cannot issue out of the Glands, but by the Pressure made by the Motion of the Joint, is become so thin, that it flows continually and irregularly; we must not therefore be surprized if they furnish so considerable a Quantity of it. This is what is called the Extravasation of the Synovia.

It's most general Causes are a too serous, or a too much dissolved Blood, and a Slowness of it's Circulation, or of the Circulation of the Lymph, which is occasioned by the Passages of these Fluids being obstructed in different Places, by Reason, for Instance, of a preceding Contusion, &c. or, because the Blood destined for the Joint is carried there by very fine Vessels, or has lost it's Motion, before it can penetrate it; or by the Admission of the cold Air, which likewise slackens it's Motion, or by the Situation those Parts are in during the Night. All those Causes occasioned the Blood, though it be dissolved, to flow more slowly, and the Synovia to be secreted copiously in it's common secretory Vessels. Lastly, if this mucilaginous Lymph becomes acrid and saline, it irritates the Tendons, and their Sheaths, &c. which are very sensible. Those irritated Parts drop, and weep, as it were, and dissolve into Serosities. Dust lodged in the Eye, the Action of Pyrethrum upon the Tongue, explains how that happens. Those who labour upon the Water, or dwell in low and marshy Places, are very subject to this Ankylosis. Whilst this Lymph preserves it's natural Blandness, it does not produce any bad Accidents, it only keeps the Knee stiff, and the Part benumbed. I call this Species a serous Ankylosis.

The fourth is produced by acritical Discharge, which the Blood makes of an acrid and corrosive Humor in the Glands of the Joint, which continually irritating the surrounding Tendons and Ligaments, gives the Patient much Pain, and considerably inflames the Joint. The Course of the Fluids being interrupted, they extravasate, ferment by their Mixture, and furnish the Matter of an Abscess, which forms in the Cavity of the Joint, and renders it very painful. If those Abscesses are not opened at a proper Time, the purulent Matter gradually becomes so corrosive, that it erodes the Ligaments, and even the Cartilages, that cover the Heads, and Cavities of the Bones,
and

and very frequently renders them carious; and the nutritive Juices extravasating irregularly round the Heads of the Bones, forms Exostoses, and very often cements them immediately.

This Kind of Ankylosis chiefly attacks the Knee, and is common to those subject to old Rheumatisms, and the Sciatica, &c.

I have seen in some Subjects, that the Epiphyses being carious, the Extremities of the Bones were united immediately. I have at other Times observed, that the Vessels which pass under the Ham being eroded, an Ankylosis was effected there by Extravasation. I call this Species a purulent Ankylosis, and I refer the scrofulous and verollic to it.

The fifth Species is the gouty. It is known by Experience, that no Liquor in an Animal coagulates more easily by Acids, than that of the Joints; we ought not therefore to be surpris'd, if that Alteration happens to it so frequently by the saline Matters with which the Blood is charged; especially, if we consider with what Slowness it is secreted. If Acids predominate, the Fluxions made upon the Joints of the Feet, Knees, or Hands of the Gouty, will occasion very acute Pains, and inflame those Parts without making any sensible Coagulations; but if Acids, besides the piercing Pains they cause, coagulate the Synovia, and change it into a Kind of Viscidity. I call this Species a gouty Ankylosis.

The sixth is owing to the Fracture of the Joint. In this Case the Texture of the Head of the Bone, and it's Cavity, having been fractured, the nutritive Juice, which is discharged and diffused, forms a Callus, that cements and closely unites those Bones, and renders the Joint immoveable. Frequently in this Species of Ankylosis, there is no Tumor at the Joint, but it sometimes happens that the Fracture having been neglected, the Matter of the Callus does not only fall into the Joint, but extravasates irregularly upon the Surface of the Epiphyses, and there forms Eminences, more or less irregular, according to the different Conformation of the neighbouring Parts, and the Care that has been taken to keep down the Callus. I call this Species Ankylosis by Fracture.

The seventh is, when the Epiphyses of a Joint swell, and exostose. The Ligaments and Tendons are then so extended and hurt, that they thereby become immovable.

Sometimes this considerable Swelling of the Epiphyses is merely occasioned by the softening of the bony Fibres, along with their Loss of Spring, and the too thick Consistence of their Juices, and then the Texture of the Bone is not de-

stroyed; but the nutritive Juices very frequently are so acrid, and corrosive, as not only to erode the spongy Texture of the Epiphyses, but also the Body of the Bone to such a Degree, that there only remains a very thin Plate, and the whole Capacity of that enormous Tumor is found empty.

In general, those Sorts of Ankyloses only happen to the Knee-Joint, whose Epiphyses are the largest of the whole Body. I call this Species an exostosed Ankylosis.

It is not difficult to make a just Prognostic of this Disease, if we attentively consider the productive Cause, it's Progress and Duration.

If it proceeds from an internal Cause, and it be antient, it is incurable. If the Caries has destroyed the spongy Texture of the Epiphysis, Amputation is the only Remedy.

It is useless to relate the Signs of all the different Species of Ankyloses, they are easily distinguished by what has been said.

As for what concerns their Prognostic, it varies according to their different Species.

The Ankyloses of the first Species are commonly cured, particularly when recent.

The Cure of the second and third also may be undertaken, especially when the Subject is properly prepared, and the Fluids are but little altered.

The fourth are more difficult to be cured, and when the Abscess of the Joint is accompanied with a Swelling, and Caries of the Epiphyses, and an Alteration of the nutritive Juices, Amputation is the only Remedy, otherwise a Portion of this putrid Matter, in which the Joint is soaked, continually re-entering into the Mass of Blood, produces many terrible, and even mortal Symptoms, as a continual Fever, burning Heat, Watchings, Loathing, Diarrhoea, and a particular or universal Atrophy.

The fifth, or the gouty Ankylosis, is rarely cured, and it's Formation cannot be prevented but by attacking the conjoined Cause, that is, by endeavouring to hinder the Leven from being generated, with which the Blood of the gouty is infected.

The sixth is incurable, because the Matter of the Callus cannot be prevented from flowing within the Joint, or from cementing the Pieces.

The seventh Species of Ankylosis is incurable, as above-mentioned.

Let us now examine how we ought to treat each of these Diseases in particular.

I have

I have said, that in the first Species, the Tendons became stiff, and the Synovia hardened; it is therefore chiefly necessary to stick to topical Application, for Recourse is not had to general Remedies so called; but only so far as they can be of Use to facilitate the Action of Topics.

The Patient being prepared, we begin with emollient Fomentations. Though the Method of preparing them be only unknown to those who are ignorant of Practice, nevertheless, in Favour of young Beginners, I think myself obliged to say, that the most common are made, either with the Broth of a Sheep's Head with it's Skin, and Leeks, or with a Decoction of Rad. Malv.—Altheæ,—Consolid. major.—Bryon. vel—Bistort.—Lilii, Fol. Ebuli,—Persicar. vel Fol. Ammi,---Fol. & Flor. Chamæmel,---Melilot,---Sambuc. & Mucilag. Sem. Lin. & --Fænigrec.

This Decoction is used as a warm Lotion in the Way of pumping upon the Part, or to bathe it therein, after which we dry it well, and use gentle Frictions, and an Uction with Adep. human. vel Medul. Cervin. of which we take equal Parts, with a sufficient Quantity of Ol. Nuc. Mosch. the whole sharpened with Sp. Vin. camph.

Sometime after, instead of the Uction, the Part is covered with Emplast. e sapone, to which we have joined Emplast. Melilot.---e Mucilag. and about a fifth of Cinnabar; then we use Emplast. de Vigo.

This Treatment must be repeated twice a Day, and near three Quarters of an Hour each Time. If the Patient be still, it would be very necessary to keep the Part many Hours a Day in a Bath prepared as above-mentioned. We continue this Method three Weeks or upwards, according as the Disease is more or less confirmed.

Some Practitioners recommend at first emollient Cataplasms besmeared with Ung. ex Althæâ, mixing, for Example, four or five Ounces upon one Pound of the Cataplasma. Every Time the Dressings are removed, we anoint the Part with the Grease, and at the End of ten or twelve Days, we use the Lotions and Plaisters. Either Practice is good, and I have seen both succeed.

Some Time after we oblige the Patient to move the Part gently, by Degrees, and in all Directions.

The Lotions serve to soften the Skin, and Ligaments of the Joint; and the Uctions to oil, and curry, as it were, the Tendons, and restore them to their natural Suppleness. But we must remark, that Grease ought not to be made use of, unless it be sharpened with some spirituous Oil, as Ol. Nuc.

Mosch.---Laur.---Castor.---Lign. Junip. or with Sp. Vin. camph. vel tartar. This ought always to be attended to.

Grease without Volatiles serves only to soften the Skin, and Volatiles without Grease to dry it, by rendering it callous. We must therefore join Emollients, Balsamics, and Grease, with Volatiles, Resolvents, and Aromatics. For, whilst mucilaginous and unctuous Things preserve the Suppleness of the Skin, and Ligaments of the Joint, they at the same Time retain the volatile Parts of spirituous Remedies, and occasion them to insinuate into the Pores of the Tendons, and penetrate into the Articulation in order to soften and dissolve the hardened Synovia.

When the Pain is great, as frequently is the Case, Anodynes are to be joined with those Remedies, such as Solanum, Hyoscyamus, or Opium; and, if an Erysipelas seizes upon the Part, then they must be omitted for some Time; for if they were obstinately continued, the Erysipelas would change into a Phlegmon, whose Matter extravasating in the Joint, would not fail to make a terrible Impression upon the bony Parts.

In such a Case, Recourse must be had to Bleedings, a proper Regimen, anodyne Cataplasms, Lotions of warm Water, or a slight Infusion of Rad. Altheæ. The Grease of an Ostrich is preferable to all other, because it is very unctuous and softening.

We usefully employ Tripe-Broth, the Saliva of Snails, or the Synovia, called Beef-Drop by the Butchers. We take four Ounces, for Instance, which we mix with a certain Quantity of Oil, which the Tripe-Men extract from the Marrow of the Bones of Beef-Legs, or with fresh Butter. We make this Mixture of the Consistence of a Liniment; or else we use May-Butter boiled with emollient, and aromatic Herbs.

A Remedy, which is likewise very efficacious, is to put the Part into the Oesophagus of a Beef, if it is the Elbow, Wrist, or Foot. It is introduced within the Aperture as far as the Thorax, and left half a Quarter of an Hour in it. Care is taken in withdrawing it to cover it with a soft Napkin, wet with a warm Liquor, as Wine, Brandy, or else the Part is put into the Belly of a Sheep newly killed. Others wrap it up in the Skin of some Animal; others plunge it into the warm Blood of those Animals. If all those Remedies are ineffectual, recourse must be had to Baths and the Sediment of warm mineral Waters, as those of Barrege near the Pirenees, those of Bourbon near Langrees, and those of Mont d'or in Auvergne.

When

When the Joint is thought sufficiently softened, it is moved and shook in all Directions. Then we hear the same Noise by the Attrition of the Viscidities, as if we rubbed dry Parchment betwixt our Hands. The Patient suffers much, but he must not be spared, and this Practice ought to be continued, until we have made the Joint tolerably supple.

We afterwards keep the Part gently in it's Motions, which we frequently repeat, we apply graduated Weights to it. If it is the Arm, or Fore-Arm, we oblige the Patient to suspend it to a Cord knotted at different Heights, so that he may have the Pleasure of seeing the Progress of the Elongation of his Arm, and we always keep it warm, and in a proper Position. As those Ankyloses very commonly seize upon the Luxation of the Elbow, we cannot dispense with keeping the Part in a Sling. We keep it rather tight for the first Days, after which we loosen it more and more to allow the Arm to extend itself, and we take Care to preserve the Suppleness of the Joint by proper Remedies, and such as have been proposed.

As to the Ankylosis, where the Extremities of the Bones are cemented either by the Fracture of the Joint, or by the Caries of the Heads and Cavities of the Bones composing it, I have already said, that it is incurable. All the Joints are subject to Ankyloses.

The Treatment of glutinous and atheromatous Tumors of the Joint is very difficult, because those Viscidities are very frequently communicated to the Blood and Joints by the *primæ Viæ*; they must therefore be evacuated to prevent them from mixing with it.

In order to which, Purgatives are used, and particularly Vomits, which are preferable in that Case. For, the Matter being chiefly contained in the Stomach, it is much better to discharge it upwards than downwards, because the Passage is shorter, and no Risk is run, by making it pass through that large Train of Intestines, and by forcing some Portion into the Blood by the Lacteals, and from thence into the Joints; besides that, the violent Compression the Stomach undergoes by the powerful Contractions of the Diaphragm and abdominal Muscles, are very proper to disengage Viscidities that adhere closely to it's internal Coat, and to that of the Intestines. Recourse is therefore had to emetic Tartar, after which the Patient is ordered to drink some Bottles of the Water of Vichy for some Days, in order to finish the Dissolution, and draw away the Rest of those Viscosities.

The best Purgatives are Gutt. Gamb. Jalap. Scammon. Troch. Alhandal. above all Gutt. Gamb properly prepared.

Mercur. dulc. & Gum. Ammoniac. are usefully mix'd with the Purgatives. The Pisan is to be made with the Woods, that is, with Rad. Chin.—Sarsaparil. Gujacum & Sassafras.

As it is of great Use in the Practice of Surgery, I will relate in what Manner it ought to be made.

I take, for Example, two Ounces of each of those Woods, well chosen, and cut very small. I infuse them twenty-four Hours upon hot Cinders, in a Pint of white Wine, according to the Quantity I would make. By Reason of this Infusion, I am not obliged to boil the Substances so long, which would occasion the most spiritous Parts to evaporate. Upon the Pint, for Instance, I pour three or four Pints of Water, and boil it in a Pot well stopp'd to a third Part, adding towards the End a sufficient Quantity of Rad. Glycyriz. Four Glasses must be taken a Day; the two first in the Morning fasting, the third four Hours after Dinner, and the fourth at going to Bed. We may join Rad. Bandan.—Enul. Campan.—vel Alni,—Bacc. Laur. &—Junip. This Decoction is of great Service to move the Humors, to facilitate their Transpiration, and dissolve the Concretions.

To the same End are dissolving Opiates usefully employed. They are made with Croc. Mart. aperien. Myrrh. Gum. Ammoniac. Æthiop. miner. Mercur. dulc. Pulv. Milleped. Mineral. Diaphoretic. & Resin. Gujac. Lastly, Acrids, Bitters, Soaps, Detergents, Incisives, as all the Preparations of Aloes. Colocynth. Chalyb. Antimon. Mercur. Milleped. are very proper, and have their Merit.

Viper Broth is also of Service. We join Rassar. Rad. Chin. to it, which, by it's volatile oily Salt, animated with that of the Viper, is very proper to dissolve not only the gross Sulphures in the Mass of Blood, but also the Viscidities that are in the primæ Viæ and Joints.

When we have no Vipers, we may make this Broth with a Pullet and a Piece of Veal, and to each Quantity one Drachm of Rassar. Rad. Chin. But nothing is so proper to facilitate the Attenuation of those crude viscid Humors, as a sober Life and Exercise. The first prevents them from generating, and the last gives Force to the Organs that should break down, digest, concoct and prepare them for Expulsion. I have already said: *Non satiari Cibus, & impigrum esse ad laborem.* Lastly, when all those Succours are not efficacious enough, nothing can better answer all those Indications, than warm mineral Waters, as those of Bourbon, which are impregnated with a saponaceous detergent Sulphur, that is conveyed in by it as a Vehicle to the most remote Parts, and is very capable of opening

ning all the Obstructions of the Viscera, of digesting the Viscidities that are in the primæ Viæ, and of giving all the Liquors a proper Degree of Fluidity.

This is what respects internal Remedies. As for Topics, the most active and powerful, must be employed.

I begin with a Cataplasm of Mustard Seed, but it must not be used long, for Fear of the Inflammation, which it generally occasions, since it is only used to open the Pores of the Skin better, and prepare it for the Action of other Remedies. After which, I apply Cataplasms of emollient Plants, but Incisives ought to hold the first Rank. Such are Bistort. vel Bryon. Cucum. agrestis, Pericar. vel Betonic. Aquatic, Nicotian. & Porrum. We join the four Flours, Mucilag. Sem. Lin. and quicken them with Sal. Ammoniac. Animal's Dung, as that of a Mule, Ol. Lumbricor. vel Ol. Castor. vel Sp. Vin. tartarised, or alkalis'd by Soap.

Every Time I renew the Cataplasm, I anoint with Adep. human. prepared with aromatic Plants, or with that of a Mule, and I likewise sharpen them with Ol. Laur.—Bacc. Junip.—Nuc. Mosch.—Laterum,—Ceræ,—Succin. or with Sp. Sal. Ammoniac. mixed with Sp. Vin. Camph. Instead of the Uncion, the Part may be covered with a proper Plaister.

Some make Use of Diabotanum, mixed with Cinnabar and Camphor, others of Emplast. de Vigo, mixed with Emplast. e Gummis, but particularly with Emplast. e Sapon. and others of Ung. Nicotian.

As for the Dropsies of the Joints, Recourse must first be had to internal Remedies.

I begin with Hydragogues, such are those extracted from Jalap, mixed with Sal. Tartar. Scammon. joined with Crem. Tartar. vel Mercur. dulc. I likewise give Syrup. e Spin. Cervin. Succ. Lilii, Elaterium, Gutt. Gamb. I also very successfully employ Sal. Epsom. because it is very aperient and dissolvent; but, as it vellicates the Intestines a little, it must be joined with Manna; I mix half an Ounce of it with two Ounces of Manna, which I increase or diminish according to the Age and Constitution.

It is necessary to give aperient Broths with Sal. Glaub. for eight or ten Days, and to purge the Patient at the Beginning and End. After which, I use dissolving and diaphoretic Opates. The Broths are made with a Piece of Veal, and Fol. Cichorii agrestis, Fol. Bugloss. &—Chærefolii. I cut the Veal into Slices, I chop the Herbs in large Pieces. I begin with a Layer of Herbs and one of Veal, &c. and I finish with a Layer of Herbs, which I sprinkle over with half a Drachm of Sal.

Vegetab. or Sal. Tartar. Martial. I lute the Pot well, and put it upon a Balneum Mariæ. I observe to purge at the Beginning and End of those Broths.

Then I employ an absorbent and diaphoretic Opiate. It is made with Diaphoretic. simp. vel Martial. Pulv. Ocul. Cancr. Corn. Cerv. philosophically prepared; Pulv. Lumbricon. Sem. Card. benedict. I mix the whole with Extract. Sambuc. vel—Junip. When we would repeatedly use Sal. Admirab. Glaub. we put twenty or thirty Grains into a Dose of the Broth. We very usefully employ Ptisans made with aperient Plants. Card. benedict is greatly esteemed. We also very usefully give the Ptisans made with Sal. Nitr.

The Use of white Wine, in which Vine Ashes, Lign. Junip. and Lign. Genist, have been boiled, is likewise very much recommended.

As for Topics, we must begin with the Cataplasm of Mustard Seed; and, as it does not fail exciting a Species of Erysipelas, as above-mentioned, in order to remedy it, I apply anodyne Cataplasms.

When it is dispersed, I proceed to Fomentations with Rad. Ammi, &—Cucum. agrest. Fol. Ebul. Flor. Sambuc.—Melilot. Bacc. Laur.—Junip. the whole boiled in Urine.

Aq. Calc. is of great Service; I use Chimney Soot in Decoction, or Cataplasm, or a Linimen. made with Decoct. Cucum. agrest. Urine, Lyes of Wine, and Sal. Ammoniac.

Some make Use of a Lye made of Oak or Vine Branches, or a few Ashes of dried Vine Lyes, the whole sharpened with Sal. Ammoniac.

Emplastic Remedies on that Occasion furnish acrid Parts, which cause the extravasated Serum to ferment, heat and open the Texture of the Skin. For which Reason I use Emplast. e Cymino, or that of the Countess, or else I make one with Nuc. Burgund. Sulph. viv. and Pulv. Euphorb.—Pyreth.—Caryophil. & Sem. Sinap. each Ingredient in it's proper Proportion.

But in a Dropsy of the Knee, nothing is so beneficial as a Vesicatory applied upon the upper Part of the Calf of the Leg; for we see, that a prodigious Quantity of Lymph is discharged by that Means, and that the Knee visibly grows less. I take Care before the Application of the Blister to attenuate the Synovia by the above-mentioned Cataplasms.

Fumigations made with Aromatic Plants and Cinnabar, and Bacc. Junip. are very serviceable; as also Stoves.

We treat phlegmonous Tumors of the Joints, after having done with the general Remedies, by first opening the Abscess, either

either with a Lancet, or a Caustic, but the latter ought to be preferred; because, by making a larger and deeper Opening, it is easily kept dilated a considerable Time. By this Means we avoid the Pains at the Dressings, and procure as copious a Suppuration as is necessary by irritating Medicines, such as Digestives sharpened with Precipitate.

But, in order to treat those Abscesses methodically, we are to guard the Joint from moist and putrefying Remedies, which entirely destroy the Spring of the nervous and tendinous Parts. Wherefore, the Topics must always be sharpened with spirituous Balsams, as that of Fiorovanti.

We must never wait for their perfect Maturity, before we open them, that we may not allow the Synovia Time, which is become very corrosive, to rot the Heads and Cavities, composing the Joint, which would render the Treatment very troublesome.

When the Condyles of the Femur are simply laid bare, and only slightly injured, we may attempt the Exfoliation by proper Remedies. One of the best is to inject into the Joint Decoct. Pericar. sharpened with Balsam. Fioravanti. It is also made with Pulv. Euphorb. --- Myrrh --- Aloes, boiled in white Wine; or it is sharpened with Ol. Gujac. mollified with a sufficient Quantity of Sp. Vin. Camph. to render it flowing and liquid.

But when the Caries is formed, and has penetrated the Cartilages to the spongy Texture of the Bones, the utmost that we can expect is, that the Part shall remain ankylosed; and, if there is no Room to hope for that, we must proceed to Amputation.

Those Kind of Abscesses happen frequently to People infected with a scrofulous Virus. For which Reason, as soon as the Abscess begins to form, Recourse must be had to the most specific Remedies. Such are the diaphoretic Ptisans, Viper Broth, with Rasur. Rad. Chin. Panacea Mercur. which we give with Caution, beginning with two or three Grains, and advancing to five or six. As soon as we perceive the Gums to swell and heat, we purge, by putting thirty or forty Grains of Crem. Tartar, with a slight Infusion of Senna into a Dose of the Broth.

As for the Swelling of the Joints of the gouty, I may say, that it ought to be looked on as the Oprobrium Medicinarum: Tollere nodosam nescit Medicina podagram.

Wherefore, I will content myself with remarking, that Fluxions upon the Joints of the Gouty are critical and salutary; it is therefore necessary carefully to avoid all repellent and astringent Topics, and also those that, by too quickly dissipating

sipating the most fluid Part of those Humours, dry and harden them, Emollient, anodyne, and the most mild diaphoretic Remedies ought to be kept to. In short, when I speak of gouty Tumors, those only are meant, that succeed the Crisis of that Disease: Now, whilst these are forming, and the Humor is in Motion, there is no Necessity, as before-mentioned, for more than anodyne Remedies, such as Citrullus, prepared and boiled in Milk, or a Cataplasm made with Bread, Rye and Beer, to which we add Cicuta, or a little Opium. A Cataplasm made with Snails is likewise used. Some successfully employ Starch, moistened like Dough, applied moderately thick.

So much for Anodynes, Resolvents and Diaphoretics. I employ the Lye of Sal. Nitr. or Urine, or a Solution of Sal. Ammoniac. mixt with either. Emplast. Tachenii is also successfully used; it is composed of Ol. Rosar. Sap. alb. Cerussa, Minium, Camphor, and Castor. We likewise apply a Lini-ment made with Brandy. Sap. Sal. Ammon. and Camph. or Chimney Soot in Decoction, or in a Cataplasm with Bran and Urine. The Poor may use Soap made into a soft Paste with Urine, or the Juice of Leeks.

To prevent that Disease, the Plethoric must have Recourse to copious Bleedings, and the Catochymic to frequent Purg- ing, and a very exact Regimen. The emaciated and bilious are greatly relieved by the Use of Milk, especially when it is their sole Nutriment.

All the Joints are subject to Ankyloses, particularly those that have little Motion, as the second and last Phalanges of the Toes. This is evident in those, who lead a sedentary Life, or in those who wear too short or too strait Shoes. That like- wise happens to close Joints, as those of the Ribs with the Sternum, or else to those that are surrounded with Ligaments and extensive Aponeuroses, and thinly covered with Flesh, as the Elbow, Knee and Foot.

Those whose Artery is opened at the Fore-Arm, and are ob- liged to undergo the Operation, are greatly exposed to it, un- less, after the Fall of the Ligature, necessary Motions are given to the Joint to divide the Synovia.

C H A P. IV.

Of the Caries.

AFTER having spoken of the Diseases of the Bones occasioned by the Impressions of external Causes, some of which attack their Substance, as Fractures; and others displace them, as Luxations; let us now examine those depending upon the Fault of the Fluids, or the Caries.

In order to a clear Explanation of this Subject, we are to recollect what has been said in treating of the Ankylosis of the Bones.

It has been observed, that the earthy Parts exceed the watry, to give the nutritive Juice of the Bones Consistence, as is seen in all Pastes, that are harder or softer according to the Proportion of those two Principles, and that the saline predominate over the oily, to make the Bones hard and solid, because they are fitted to apply themselves exactly to one another on Account of the Regularity of the Surfaces of their Planes. The most essential Principles of the nutritive Juice of the Bones are then Earth and Salt, and there is only as much Water as is necessary to moisten the Earth, and serve as a Vehicle to the Salt, and as much Oil as suffices to bind and mollify the Saline Parts.

This Analysis shows, that the nutritive Juice in it's natural State is soft, mucilaginous, and very proper to bind and unite the small Parts composing the Bones. But, if the above-mentioned Proportions are not followed in the Mixture of those Principles, many Disorders happen. For Example, if the Phlegm is in a greater Proportion than the Earth, and the Oil than the Salt, this nutritive Juice will become too thin, soft, incapable of preserving the Hardness of the Bones, because the Salts being dissolved in too great a Quantity of Serum, the Planes of their Surfaces cannot apply themselves to one another, since they are sliding away continually. This is the Manner in which the Bones may become soft, and return to the same State they were in at the Beginning of Life.

If volatile alkaline Salts predominate, and are diffused in a Part proportioned to their Quantity, the nutritive Juice will become too penetrating and volatile. If the Salt exceeds, and, instead of being diluted in a sufficiency of Water, is bound and entangled in the earthy Parts, it will make the nutritive Juice of the Bones of the Consistence of Mortar; wherefore, it can no longer insinuate into the porous Texture of the Bone, and the Passage for the Juices, that come a-fresh, being closed, an Obstruction

Obstruction will form in the offic Vessels, and the saline Parts heaping upon one another, will form Exostoses. Lastly, if the Salts, though dissolved in a sufficient Quantity of Water, are no longer bound nor loosened by the Oil, their Points will be quite free and disengaged, and will penetrate through the Gluten, that connects the bony Fibres, they will erode and divide them, and from thence proceed Caries.

The Salts of the nutritive Juice may be thus altered, without changing their alkaline Nature; but, if they become acid, they produce those Disorders sooner and more violently. Now the Acids are either fix'd and earthy, and in this Case they coagulate the nutritive Juices, and intercept their Course, which produces Exostoses; or they are volatile, that is, their Points are less blunt, and are rendered very sharp, and are joined to very subtil Sulphurs; all which makes them capable of eroding, piercing and lacerating the Texture of the Bones, and of causing Caries.

Lastly, when the Water and Oil fail, the bony Fibres become stiff, and as brittle as Glais.

It is evident from what has been said, that the Salts of the nutritive Juice of the Bones having become acid, are either entirely disengaged from the Pores of the Earth, and especially from the branching Parts of the Oils, in which Case they may be compared to Aqua fortis; or they are greatly volatilized and joined to very subtil Sulphurs, then they ought to be compared to an arsenical Salt. Those two Kinds of Alterations dispose the nutritive Juice of the Bones to erode and lacerate the Texture of the Bones, that is, render them carious, as will be shown.

A Caries is in the hard Parts, what an Ulcer is in the soft; and their Distinctions are taken from the different Diseases they succeed.

Now those Diseases proceed either from the whole Body, or from the Part itself, from the whole Body, when it is infected with a verolic, scorbutic or scrofulous Virus.

As for those proceeding from the Part itself, they depend upon the soft or hard Parts.

The Diseases of the soft Parts are Wounds where the Bones are laid bare; Abscesses that are opened too late, old Ulcers, great Inflammations and Contusions of the Periosteum.

Those of the hard Parts are Fissures, certain Species of Exostoses, Fractures, Abscesses and Inflammations of the Marrow.

Let us explain in general, how the Bones alter in all those different

different Diseases, and let us begin with the Changes depending upon the Scurvy, and Lues Venerea.

As each Virus has a peculiar Character, we must not be surprized, if they associate, and unite with some Humors, sooner than with others, and if they make different Impressions upon the Bones. For Instance, the verolic is very subtil, and penetrating; which is perceived as well from its easily passing from the Inguinal Glands into the Testicles, and from the Testicles back again, as from its sometimes infecting the whole Mass of Humors without producing any Impression upon the Organs that gave it Entrance into the Body. It more particularly unites with the Lymph, and all it's secretory Organs, that is the Reason why it so frequently attacks the Glands of the Groin, Gums, Velum Pendulum Palati, Tonsils, Palate, Skin, &c.

The scorbutic Virus is grosser, and consequently less penetrating: It more particularly associates with the Blood, and the Parts most moistened with it, and from thence proceed the large livid Spots like Contusions, Swellings, and Indurations of the Abdomen, femoral Muscles, and especially the Legs, by Reason of which, those Parts remain bent, and the Feet extended; from thence proceed Ulcers, and putrid Gums, and Caries of the upper and lower Maxillary Bones.

The scrofulous Virus is an Acid, that is neither so volatile as the Verolic, nor so gross as the Scorbutic. It more particularly unites with the Synovia of the Joints, and nutritive Juice of the Bones, it does not exalt, 'till after it has remained a long Time in those Parts, it may be considered as a softening, and putrefying Leven.

Though the Mass of Humors may be infected with those Levens, nevertheless they do not act upon the Bones 'till they are arrived at the last Degree of Subtily, which is effected sooner in some than in others, according to their different Degrees of Volatility, and the different Subjects they attack, and there is Reason to believe, that what makes them to act sooner upon some Bones than others, for Example, upon the internal Part of the Tibia, Ossa Nasi, Os Frontis, and the other Bones of the Skull, is that they are more exposed to the Injuries of the Air, and Impressions of external Bodies. It is necessary to add, that being scarcely covered with any Thing except the Teguments, which are first infected with such Poysons, their Action is more easily felt. Indeed the Caries of the Bones of the Scorbutic and Verolic, are frequently preceded by Ulcers, from whence are discharged corrolive Humors, that have eroded the Periosteum, and Bone. Sometimes the soft Parts, and the Bones they cover, ulcerate together by the Discharge the Blood at the same Time makes

makes of a Portion of Scorbutic, or Verolic Virus, in both Parts. In other Cases, those Levens spare the soft Parts, and only attack the Bones they cover, even as Aquafortis spares Wax, and only acts upon the Copper. Likewise are the Scorbutic and Scrofulous seldom subject to Nodes, and true Exostoses.

In general the Bone being laid bare by any Ulcer; it is moistened with the scorbutic Lymph, and it's whole Texture swells, and becomes spongy. In what Part soever the scrofulous Virus fixes, it produces the same Disorder, but particularly in the Hands and Feet. In the Scurvy, that only happens to the upper or lower Jaw, whose Gums are ulcerated; but both in the scorbutic, and scrofulous Virus, the Portions of the Bones, that exfoliate are moistened, swelled and spongy, and of a greyish Colour. It may be of Use to observe here, that the Scurvy chiefly attacks the Thighs and Legs in Adults, and the Mouth in Children.

Let us now examine, how the particular Causes of Caries act; and begin with those succeeding Abscesses, that are opened too late, and old Ulcers.

Pus is known to have a Sourness, which is obvious by it's Smell, by it's Mixture with Tincture of Turnsol, whose Colour it changes, and by it's Effect upon Iron, or Silver. We likewise know that the nutritive Juice of every ulcerated Part grows acrid, through the Alterations caused by the Air, and by an Acrimony that is inseparable from the Ulcer, and that has different Characters according to the Quality of the Blood, and Circumstances met with at the ulcerated Place. This being granted, it is easy to comprehend, why an Abscess, that is opened too late, renders the Bone, that is underneath, carious; since by that Delay, Time has been given the purulent Matter, which by it's Lodgment is become acrid and corrosive, to open itself Passages to the Bone, and affect it; this is the Reason, why the Parts cannot remain long ulcerated, but the neighbouring Bones will be injured, because the corrosive Sanies discharging from them, falling upon the Periosteum, erodes and uncovers the Bone, which it affects by it's Lodgment there. This is seen in old Ulcers of the internal Part of the Leg, Ribs, Sternum, Clavicles, Vertebrae, Os Sacrum, in old Fistulae Lacrymales, and those of the Sacrum; and the Bones are affected in those Cases so much the more easily as they are scarcely covered with any Thing besides the Teguments.

Caries also succeed Fissures of the Bones, and certain Species Exostoses and Fractures.

The

The Fissure is frequently accompanied with an Abscess, which is formed by the Collection, and Mixture of the Juices, that ooze out of the ossific Tubes, and Vessels of the Periosteum; and which soon degenerates into an obstinate and carious Ulcer, unless it be seasonably opened, and carefully dressed.

In Fractures where the Pieces are at a great Distance, particularly if the upper Part of the Femur is broken, the nutritive Juice which cannot be collected, diffuses in the Neighbourhood, and mixing with the other extravasated Juices, becomes acrid, putrefies, and rots the fractured Ends.

In compound Fractures, the whole Thickness of each End almost always exfoliates, because it has been affected by the purulent Matters, that have remained in the Neighbourhood, by the Medicaments applied over them, and by the Admission of the Air to them during the whole Course of a long Treatment.

Exostoses are very frequently attended with a Caries, and for the following Reasons. Whilst the acid Salts, that obstruct the ossific Vessels, and form the Exostosis, are fix'd and entangled in the earthy and sulphureous Parts, they do not act upon the Texture of the Bone; but as they unfold, and exalt gradually, their Points disengage themselves, and erode those very Tubes, in which they were before at Rest, and then a Caries is joined to an Exostosis.

The Blood very frequently makes a critical Discharge of a Surplus of heterogeneous and saline Matter in the Texture of the Bones; from thence proceed the Caries after the Small Pox, or a malignant Fever. In this Case, the whole Disorder passes in the Bone, which alters in so obscure a Manner, that it is very difficultly perceived, because the Muscles, and Teguments are not concerned.

Caries are sometimes owing to Abscesses formed in the Marrow, or to the corrosive Quality of it's contained Juices; and, then the Caries does not show itself till after it has pierced the Body of the Bone.

It is evident from what has been said, that every Suppuration upon a Bone, or amongst it's Fibres, whether the extravasated Matter comes from it's surrounding soft Parts, or from it's Texture, Periosteum, or Marrow, alters it somewhat by it's Lodgment.

Let us now examine how a Bone that is bare, alters.

First, it is stript of it's Periosteum, that is of it's nutritive Vessels. Secondly, the Air acting on the uncovered Bone, gradually fixes the nutritive Juices, that circulated there; this begins to intercept the Passage of those, which the uncovered
Part

Part might receive from the sound, by the Communication between the external and internal Vessels. Thus that Portion of the Bone does but partially enjoy the common Life of the whole, and there is no Doubt, if it remains long exposed to the Air, of it's altering more and more; that is to say, the Circulation may be entirely interrupted, and consequently it may be deprived of Communication with the sound Bone; thus it will become as a foreign Body, that ought to be separated from it. It is obvious from thence that in that Species of Caries, the Bone is simply deprived of Nutriment, and that there is scarcely any Thing corrosive, neither in the Air, nor Fluids.

Caries succeeding violent Contusions of the Bones are also owing to the Suppression of the Course of the Fluids.

It will be objected, that many Inequalities are seen in the exfoliated Bone, which are Proofs, that the corrosive Juices have affected the Separation; but it is answered, that they are solely owing to the Disunion of the different Bundles of Fibres composing that Plate.

In the other Species of Caries above-mentioned, the Bone passes through different Degrees of Mortification.

The first depends upon the Lodgment of the purulent, or corrosive Matter upon the Surface of the Bone, for it cannot remain long there without altering it; and as it meets with softer Places in some than in others, it more easily erodes them, whilst the others resist it's Action; and that makes the exfoliated Part always uneven, where it is separated.

But if this corrosive Juice remains there a considerable Time, it commits still more terrible Havock, by opening Passages into the remotest Parts of the Bone, and by corrupting the nutritive Juices that moisten it. Then it slides in a spiral Course, and erodes, and separates Plates, or Leaves, longer, or shorter, and thicker, according as it is more or less acrid, moveable, and fluid. This is what causes the second Degree of Mortification. But all the Fibres of the altered Part are not deprived of the Communication they had with the neighbouring Parts. Many still adhere to the sound Bone and Periosteum, and receive nutritive Juices, which alone will prevent the Disunion of that Portion of the Bone, whose Fall cannot be procured but by finding Means proper to finish the Separation.

In some Bones the last Degree of Mortification happens, when the corrosive Liquor divides, and erodes it's Texture, in such a Manner, that it's Fibres are, as it were, minced into little Parcels, and then we are not to hope that the mortified Part will separate into Plates. We on the contrary see it lose it's Hardness; and it's Parts having no more Connexion, it falls by little

the Pieces, like Scales, or Dust. This is the last Degree of Alteration of the Bones, called Worm-eaten.

All the above-mentioned Caries may be reduced to the two following Species; first to those where the Bone, being stript of it's Periosteum, is exposed to the Injuries of the Air, and deprived of it's Nourishment; secondly, to those caused by the Action of a purulent, or corrosive Matter. The first ought to be compared to the Changes the Branches of Trees undergo when they dry through Want of Nutriment; the second to their being worm-eaten.

In the first Species the Texture of the Bone, that exfoliates, is hard, compact, white, it is neither eroded, nor swelled; in short, it's Fibres are simply dried, and closed by the Stagnation of the Fluids. The same Thing is observed in the Branch of a Tree, that falls through Want of Nutriment; for it's Fibres are entire, firm, and without any sensible Alteration; their mere Dryness excepted.

It appears in Consequence of what has been said, that the proximate and immediate Cause of all Caries is a corrosive Acidity. Indeed Experience teaches us, that none but such like Liquors can penetrate, and dissolve the Bones. If, for Instance, Sp. Sal. vel Sp. Vitriol. is applied to any Tooth, it becomes yellow, then carious, and falls by Pieces; whereas the true Means to preserve the Teeth, and keep them white, is to use Things charged with alkaline Salts. The same Thing happens to other Bones by applying corrosive Liquors. It is also very frequently seen that the Lymph near the Bones renders them carious, as soon as it becomes acrid by what Cause soever. That is the Reason, why Ulcers of the Joints, Eye, Nose, and Mouth are so subject to a Caries, because all those Parts are moistened with a great Quantity of Lymph, which very easily associates with the corrosive Salts, which the Mass of Humors is infected with.

In the Caries, where the Course of the Fluids is simply intercepted, the Bone being stript of it's Periosteum, and exposed to the Air, the volatile Salts fly off gradually, and draw along with them some oily Particles, they likewise open the Phlegm a Passage, which evaporates insensibly, but the earthy Parts, as the most fix'd, remain with some Portion of the other Principles, which they keep entangled. Thus the Piece becomes dry, and more brittle, and nearly like to a Piece of float Wood, and this Change is known by it's pale Colour. Then those Fibres shrink considerably, and their Pores change. That Piece notwithstanding does not seem to be less, because it's external Part is supported by the Fibres of the Diploe, or by the close Union

betwixt the Plates those Fibres compose. From thence it follows, that though the Fibres of the altered Bone answer in all Appearance to those of the sound Part, as well by their Size, as by their internal Configurations, nevertheless they do not answer exactly. That is the State of a Piece of Bone rendered carious by the mere Interruption of the Course of the Fluids.

During this, the Blood, and nutritive Juice are continually propelled with the same Degree of Force from the Sound to the altered Part of the Bone, but the Course of the Blood is stop'd there by the Depression of it's Vessels, and Loss of the Periosteum that sustains the Vessels appointed to nourish those bony Fibres; thus the Blood is obliged to recoil, and return, as it were, upon it's Current, which occasions it to strike and shake the Extremities of the bony Fibres, and Vessels violently, and by repeated Strokes of Pistons, it forces them to separate mutually from every Part, nearly as a Plate of Lead, or Brass Wire is broken, by being repeatedly bent to the right and left.

In those Sorts of Caries, the Fibres, and Vessels of the sound Part oblige those of the carious to separate; and if those Fibres undergo any Attrition, as happens in Contusions, the Separation will be still more easy.

In Caries proceeding from a Fault of the Fluids, the Separation is still easier and quicker, because the Acids destroy the Alkaline Salts, and corrupt the other Principles of the nutritive Juice. Besides, they lacerate some of the Blood Vessels, they cauterize the Extremities of others like so many Buttons of Vitriol, they cut the most tender bony Fibres, and erode the grossest; and the Disorder is greater or less according to their Force; thus the Fibres that still adhere to the sound Part, being half eroded, and separated from one another, break for the same Reasons already related in speaking of the dry Caries, but more easily and sooner.

It must not be forgot, that whilst the carious Piece is thus deprived of all Communication with the sound, we see rising from the Extremities of the sound Part little Buds, like granulated Flesh mixed with white and red, whose Formation may be explained in the following Manner.

The nutritive Juice, being propelled with the ordinary Force to the Ends of the Fibres of the sound Part, fixes there in the Form of little Drops, as is the Case with all Kinds of Liquors, particularly if they are glutinous, whether they be propelled, or whether they flow by their own Weight, along a small Stick. At the same Time, all the Blood, thus propelled, finding it's ordinary Course obstructed, forces, dilates, distends, and elongates the collateral Branches of the obstructed Trunks, which being

being supple and tender, yield easily, and consequently are disposed to receive a larger Quantity of nutritive Juices, which makes them grow in all Directions, and get amongst the small Drops of bony Juice, which continues to flow on, and insinuate betwixt those little lengthened Branches. Thus it lengthens the first Drops it fixes on, so that by this Flow of ossific Juice one Drop heaps upon the other, and forms as it were new Filaments by the same Mechanism, as Iceicles are formed at the Ends of cylindrical Bodies by the Flowing of melted Snow, or as is done by the dropping of a lighted Candle. In Proportion as those Granulations rise, they forcibly lift up the carious Piece, and separate it, and their Efforts being supported by the Diastoles of their surrounding Vessels, force it to separate either entirely or partially, according as there are more or less Inequalities, or Depressions in the Circumference, or internal Surface of the Piece that exfoliates. These Granulations sometimes run in so deep, that the Piece cannot be removed without lacerating them.

It is evident then that the Caries is a true Gangrene, and that all those Alterations of the Bones might be easily reduced to the two following Species; namely, those depending upon a Blood infected with caustical, and arsenical Salts, like the Gangrenes, that attack Ulcers, Burns, scorbutic Eruptions, the Small-Pox, Lues Venerea, malignant Fevers, Diseases, where the Blood being infected with a corrosive Virus, erodes the Muscles, and cauterises, as it were, the Vessels; and like those owing to the Interception of the Course of the Blood, as are Gangrenes caused by tight Ligatures, and Compressions of the principal Trunks of the Arteries; for the Alterations the Bones undergo, when laid bare, are quite similar to this last Species of Gangrene, and all the Rest may be reduced to the first Species.

But it is not sufficient to know, how a Plate of Bone is altered, and rendered carious, it is moreover necessary to be well informed of the Process Nature uses to detach it; this is called Exfoliation, which is a pure Work of Nature, Art contributing but very little thereto.

We see continually rising, as already remarked from all the sound Part of the Bone, that is, betwixt the sound and diseased Bone, a soft Substance composed of many little Grains, which increase by Degrees. Those Grains unite with those, that rise from all the Circumference of the Wound, and hardening gradually, they form those different Degrees of Consistence, that are remark'd in the Formation of the Callus.

It is necessary therefore to consider those Grains, as so many little Wedges placed under the diseased Bone, which in Consequence of the continual Impulse of the Fluids, that is of the powerful Contractions of the Heart and Arteries, raise up, separate, and lacerate the Bundles of altered Fibres, that adhered to the sound Bone, wherefore is it commonly said, that the live Part pushes the dead.

We sometimes see those little Bud-like Grains push so forcibly, that they pass through the small Holes of the carious Bone. Frequently, the diseased Plate being very thin, they break it into many Pieces, and pass through the Fissures; this renders the Exfoliation more or less sensible, according as the detached Pieces are greater or smaller. It is to be remembered, that a Bone, though dry, or carious, does nevertheless sometimes admit a Covering of Flesh, and does not exfoliate, till long after the Cure of the Wound, which causes a fresh Abscess in that Part.

Now a Surgeon ought to distinguish clearly the Nature of the Flesh, that covers a sound Bone from that which covers a diseased one. In the first Case, the Flesh is firm, granulated, of a vermilion Colour, sensible, and adherent to the whole Surface of the Bone that exfoliates; in the other, on the contrary, the Fungus is only an Elongation of the fleshy Fibres near the diseased Bone; it is soft, fungous, whitish, insensible; lastly, it yields to the Touch of the Fingers, for it always shakes upon the Bone below, because it has no Connexion with it's Texture. It is not so with the Buds formed by a Prolongation of the Vessels, that push all the sound Part of the Bone that exfoliates, and that unite with those of the Muscles and Skin, in order to make but one Cicatrix, that is firm and adherent to the Bone. But this Prolongation can only be made to a certain Point, and the Flesh produced beyond is only Vesicles heaped upon one another, which is smooth, flat, and of a palish Cast, and consequently very different from the granulated Flesh before-mentioned, that is, it is made up only of stagnated Juices, that are no longer subject to the Laws of the Circulation, and which ought to be destroyed, and cut away as soon as possible, if it covers or hides the carious Bone.

It's Alteration may then be known by the Nature of this very Flesh. It may also be discovered by the Colour of the Skin at the Edge of the Ulcer, and by the Quantity, Quality, and Colour of the discharged Pus.

Indeed the Skin is then of a violet, or lead Colour, the Pus is very thin, grayish, foetid, and of an urinous Smell, it blackens the Linen, and a greater Quantity discharges than should be in
Proper-

Proportion to the Ulcer. It is surprising, that a Wound should re-open at the End of ten, twenty, and even thirty Years, by a fresh Abscess accompanied with an aguish Fever, in order to open a Passage to a small Splinter, that Nature forces outwards, and that immediately after it's Exit, the Wound should close exactly.

As the Callus formed in the Place of the exfoliated Bone is produced by the Flux of the glutinous Matter, that serves to nourish the Bone, it ought to be as hard and compact as the Rest of the Bone, but it is less so, and the Bone is always more depressed in that Part, which happens for many Reasons; first because the ossific Juice, that formerly flowed by straight Fibres, and in a parallel Line, being turned by the Interruption of those Fibres, those that form afresh are obliged to curve; this does not prevent the Course of the ossific Juice, whilst they are yet soft, and tender, but in Proportion as they harden, they compress one another, by Reason of those Curvatures, so that the moving Powers are no longer sufficient to propell the bony Juices so vigorously thither as before. Besides the nutritive Juices meeting with fresh Obstacles, as well from the Air, as from the Medicaments; the Vessels and nutritive Juices cannot be lengthened out as much as would be necessary.

The Depression at the Cicatrix is greater or less in Proportion to the Thickness of the exfoliated Plate, or Pieces, and it is generally more remarkable in the Epiphyses, where we sometimes see Holes, large enough to receive an Egg, because there is a greater Loss of Substance by Reason of their spongy Texture.

Sometimes the bad Treatment of the Surgeon may contribute to increase the Cavity of the Cicatrix, because he presses and tents the rising Granulations too much, or he uses too drying Remedies. Lastly, the Cicatrix is white, without Hair, and dryer than the Rest of the Skin, because the Fibres are very close there, and the Bulbs of the Air, and cutaneous Glands have been destroyed.

Sometimes the Cicatrix is so thin, that it rubs off by the least Friction, and leaves the Bone bare. That is seen in such Exfoliations, as have been preceded by so considerable a Loss of the Teguments, that the new Skin, being unable to reach to the Center of the Wound, it is only covered with a very thin Pellicle, like a Prolongation of the Epidermis. That is the Effect of the Contraction of the Vessels, or other Obstacles, that proceed as well from internal, as external Causes.

Therefore whenever a Surgeon sees a Cicatrix hollow, and adherent to the Bone, he ought to conclude there has been an Exfoliation.

Exfoliation. Though it was not hollow, but did adhere, and was immovable, this would always be a Proof of a slight Exfoliation.

It happens nevertheless, that a Bone, though bare, is covered again without exfoliating, and without almost adhering to the Skin, but that only obtains in Wounds, where the Alteration of the Bone is superficial, and where they have been dressed softly and quickly. Then as the Vessels at the Surface of the Bone are not yet obstructed, and as they communicate with the internal, the nutritive Juice is continually carried thither, and the Surface granulates at their Mouths, in such a Manner that the Circulation easily and quickly recovers it's ordinary Course.

In the worm-eaten Caries, the Ulcer cicatrizes seldomer, and a Fistula remains 'till the Exfoliation is entire, for which Reason the surrounding Flesh ought to be prevented from growing too luxuriantly by Means of Tents and dry Lint; and Tinct. Myrrh, and Aloes must only be employed. It is even necessary to destroy that Flesh, if it rises quickly, by slightly, but repeatedly passing the Lapis Infernalis.

Young Surgeons ought to be very careful, whether in using the Ruginé, or in applying Fire, not to destroy that soft, and granulated Flesh which shoots up from below. They should not therefore use them, except when the Alterations of the Bones are very deep, and in the Beginning of the Treatment.

As soon as they perceive the Flesh begin to rise, it is necessary to desist from the Use of them. For as the Ruginé must be forcibly pressed upon, the Granulations may be bruized in Pieces, and destroyed, and the Cautery cannot be so well managed, but that their Points will feel it.

The Time of the Exfoliation depends chiefly upon the Age, and Texture of the Bone.

The Exfoliation is very thick in young People, as well by Reason of the Quantity and Quality of the nutritive Juice, as of the Texture of the Bones. In a young Man who is strong and vigorous, the Vessels are full of Blood, and the bony Fibres overflow, as it were, with nutritive Juices. Besides, they are soft and flexible, and free to dilate; thus every Thing conspires to make those Juices flow copiously. We ought not then to be surpris'd, if those small Granulations push with so much Vigour, and Facility, and if they so quickly throw off the injured Piece of Bone.

It is likewise remarked in Children, that the Exfoliation is generally thinner, and less extensive than in Adults, on Account of the Softness of the bony Fibres, and it sometimes happens

pens in both, that the Alteration of the Bone being slight, the Exfoliation is effected insensibly, even after Amputations. That is obvious in all fresh Wounds, where the Bone is slightly affected.

The Exfoliation is slower in Adults, because the Blood has lost some of it's Velocity, and the Texture of the Bone is much closer, it's Pores being already half closed, and most of it's Vessels consequently obstructed; therefore much less Nutrient passes there, which occasions the Bone to exfoliate more slowly.

In old Age, where scarcely any Vessels communicate with the Bone, and where the Motion of the Heart and Blood is very weak, and the Texture of the Bone very hard, the Fall of the dried Bone must be long waited for.

It is easy to conclude upon those Principles, that in all Ages, the harder and thicker the Texture of the Bone is, so much the slower is the Exfoliation in effecting. Indeed, Experience shows, that the Middle of a Bone is longer in exfoliating than it's Epiphyses, and that the Caries advances much quicker in the tarial Bones, for Instance, than in the Tibia.

When the Structure of the Bones is fully understood, and we know that the thick and long are composed of many Plates laid upon one another, and that they are numerous, and closer towards the Middle of the Bone than towards the Extremities, whose whole internal Part is of a very spongy Texture; it will be easy to explain, why the Exfoliation is only made by Plates in the Body of the Bone; whereas in the Epiphyses, and other spongy Bones, it is merely in broken Pieces, or little Filaments.

Great Exfoliations sometimes happen, where the Tibia, for Example, exfoliates almost entirely, and in it's whole Thickness, the Epiphyses remaining firm in their Articulations; this is seldom the Case, except in Subjects where the Epiphyses not being yet united, and cemented to the Body of the Bone, the Progress of the Caries is stopped by that Interruption.

Undoubtedly, a fine Season, a strong and vigorous Constitution, a very regular Manner of living, and great Calmness of Mind, render the Exfoliation more easy.

Let us pass to the Prognostic, and Method of treating Caries.

It is not difficult to make a just Prognostic of Caries, when we consider well their Duration, the Cause that produced them, and the Place where they happen.

Old Caries are with Difficulty cured, and Hippocrates forewarns

warns us, that those that have remained above one Year seldom yield to the Power of Medicines.

Caries succeeding Wounds are infinitely less dangerous than those coming after old Ulcers, or critical Abscesses.

All Caries from an internal Cause are more dangerous than others. Those kept up by a verolic, scorbutic, or scrofulous Virus, where the whole Mass of Humors is infected, are very obstinate, and their Cure must not be expected but by specific Remedies.

Frequently, the Cause that keeps up the Caries is different from that which produced it. For, though the first be external, and might easily be cured, it may nevertheless happen to a sickly Subject, whose Blood is so vitiated, that it continues and increases the Caries.

The Caries never makes so great a Progress in very solid and hard Bones, as in the spongy, for which Reason, if it attacks the Middle of the Tibia, or Femur, it is less dangerous; but on the contrary, when it is in the Joint, it makes a very great Progress in a little Time, and it's Treatment is very perplexing, through the Difficulty of discovering, and applying Medicaments to it, by Reason of the great Number of surrounding Tendons and Ligaments.

When the Caries has seized upon a considerable Part of the Body of the Bone, and causes Abscesses, or great Inflammations, that produce a Fever, which extend to the Joint, we must amputate without Hesitation.

Caries ought to be treated variously, according to the different Causes.

Necessary Revulsions are made by general Remedies, and if those Diseases are kept up by a particular Virus, they must be encountered by specific Medicines, whether antivenereal, antiscorbutic, or antiscrofulous.

We generally purge with Pilul. Mercur. or with Scamon, Mercur. dulc. & Troch. Alhandal.

Recourse is had to Vulneraries, and the Decoction of the Woods. We usefully employ dissolving and absorbing Opiates, made with Pulv. Milleped.---Lumbricor. Ocul. Cancr. Antimon. diaphoretic. Mercur. dulc. Sperm. Ceti; and in the Scurvy we mix the antiscorbutic Plants therewith. In short, all the internal Remedies ought to tend to destroy the Causes, that kept up the Caries, and to animate the Blood, in order to facilitate the Vegetation of the Granulations, by increasing the Force of the moving Powers.

In all Wounds, where the Bones are simply laid bare, we are only to think of their Re-union. We content ourselves with

with applying dry Lint, or Lint dipt in Sp. Vin. to the Bone, and Pledgets upon the Flesh spread with Liniment. Arcaei. If the Wound is in the Head, the same Method ought to be pursued, provided that after due Examination, there is no Reason to fear, either for the Brain, or it's Membranes.

We might even look upon dry Lint as useless in that Case, and dispense with applying it to the Bone; the same Pledget covered with the Balsam might answer all the Indications. Over that we apply Emplast. de Vigo, and a good Compress dipt in Sp. Vin. Such Wounds may heal in a short Time, whereas in the common Method, they are dressed two Months, and we are frequently obliged to apply Caustics upon the Flesh.

Belloste pretends to have found out a Method, which he believes is quicker and surer. At the first Dressing he pierces the Bone in several Places with the Pyramid, or perforating Trepan. By this Means, says he, a Passage is given to the Succus Medullaris, which by congealing soon covers the Bone again, without it's losing the least Portion of it's Substance. He says, that the Bone is seen granulating thro' the Hole made with the Perforative, and that it covers again entirely at the End of three or four Dressings.

This Method struck me at first, and, I own, I impatiently wished to have a Proof made of it in our Hospitals. Mr. Petit, a very able Surgeon, and chief of the Hotel Dieu, tried it without any Success. It answered no better with Mr. Mery, who succeeded him. The Case was to prevent by this Means the Exfoliation of the first Table of the Parietal, which ought to follow that of the Circle of the Trepan. He therefore bored many Holes with the Perforative, and he perceived that nothing passed through them, that could serve as a Covering to the Bone, and that it had even retarded the Exfoliation, the nutritive Juice being emitted through them, and serving to form a little Bump or Eminence, at the internal Part of each Hole.

Let us now see how the Caries ought to be treated, according to the different Degrees of the carious Bone.

If it is occasioned by the Air, and is superficial, we content ourselves with applying a Pledget dipt in Spin. Vin. upon the Bone, and dress the Wound as seldom, and quick as we possibly can.

If the Alteration of the Bone is deep, the Bone having been long exposed to the Air, or greatly contused, the Rugin is employed to shorten the Cure, and prevent an Exfoliation, which we must necessarily wait for forty or fifty Days, and

and sometimes more. By this Means the whole Surface of the altered Bone is removed; and when the Bone is brought to it's natural and vermilion Colour, that is, when it becomes of a white tending to a red, we are not to pass beyond, nor keep the Lips of the Wound separated, but leave it to cover again with Flesh. This Method is very proper to obviate the Impressions of external Causes.

The good Effect of the Ruginé on that Occasion is, that by destroying and removing the injured Part of the Bone, it causes the internal Vessels to push up, with more Ease, little Granulations of Flesh, which should serve to re-unite the Wound. The Ruginé only serves in this Case to remove the Callosities of the Bone. It is the same as in the soft Parts, when the Edges of a Fistula are callous, we remove them to make the nutritive Juices flow.

Such Caries not being kept up by any Fault of the nutritive Juices, their free Distribution only wants to be re-established to effect a quick Cure.

When the Depth of an Abscess shows, that the purulent Matter may act upon the Bone, it must be quickly opened, though it should not be mature, particularly if it is near the spongy Bones, as those of the Palate, &c.

When an Ulcer is near a Bone, and it's discharged Sanies begins to attack it, we are only to think of drying up the Ulcer as soon as possible.

If the Bone is altered, and not laid bare, all the flabby Flesh, that covers it, must be carefully removed. Dry Lint is applied at the first Dressing to stop the Hemorrhage, and at the second are used Remedies more or less active, according to the Depth of the Caries.

If it is simple, Pledgets dipt in Sp. Vin. Camph. are only applied, and Care is taken to prevent the Growth of Flesh till the Piece of Bone is separated.

If it has made any Progress, Recourse is had to Tinctures, or balsamic Powders, such as those of Myrrh and Aloes. Wine mixed with Honey and sharpened with those Powders, is a real Specific. With this Remedy I have treated many Children seven or eight Years of Age, condemned to have the Leg cut off, and they have been perfectly well cured.

The above-mentioned Tinctures serve to deaden the Action of the corrosive Juices, which cause the Virus of the Caries, and prevent it's Progress. They likewise make a Varnish, that defends the Granulations against the Action of the Air and caustic Salts.

If the Caries is deep, Recourse is had to still more powerful Remedies, but the above-mentioned Injection of Wine and Honey is a potent Specific, when the Caries is from an external Cause.

In order to a clear Comprehension of their Action, we are to observe, that there still remains in the Plate of Bone, which should exfoliate many Bundles of Fibres, that communicate with the sound Bone, that is, which are nourished and enjoy Life in common with the whole. If we would procure the Fall of this Plate as soon as possible, it is absolutely necessary to destroy it's Commerce with the sound Bone, or mortify it entirely, for otherwise those Fibres being continually nourished, and resisting the Impulsions of the Granulations, oppose the Separation of the carious Piece.

Besides, the nutritive Juices being continually carried to the carious Piece by the sound Fibres, and mixing with the corrosive Juices that moisten it, they become of the same Nature. Thus the carious Part is a Kind of Mine, where this Virus increases, and is continually exalted.

Lastly, whilst the Fibres of the Bone are choaked up with those bad Juices, we ought not to expect the Exfoliation, because the nutritive Juice ought to be in it's natural State to throw out good Granulations, that is, it ought to be bland, mucilaginous and balsamic. Secondly, those corrosive Juices are as so many little Razors, that cut and shave, as it were, the granulated Flesh rising from the sound Bone.

In order to procure an entire Mortification of the Bone, in those deep Caries, Recourse is had to Medicaments; and, if they are ineffectual, to Instruments. The most mild Remedies are absorbing Powders, as those of Antimon. diaphoret. Ocul. Cancr. Test. calcin. -- Nuc. Gall. Pulv. Lumbricor. and such like. It is very obvious that, amongst those Powders, some are proper to deaden the Acrimony of the corrosive Juices, and correct them by their balsamic Parts, and others to absorb them by their spongy, absorbent and desiccative Parts.

If the Caries is deeper, as in those accompanying old Ulcers of the internal Part of the Leg, Recourse is had to Instruments: Such are Rugges, Googes, the Exfoliative, and even the Trepan, the Saw, &c.

When the Caries is of a moderate Depth, the Ruggie is used. Care is taken to guard the Edges of the Ulcer with little Linen Rags, to prevent them from being cut by the Ruggie, and preserve them from the Action of the Air, and when all the carious Portion is removed, we apply Pledgets dipt in Sp. Vin. Camph. and dress seldom.

If the Caries is very deep, the Googe is used, and we thin the altered Bone as much as we can; after which we apply Pulv. Euphorb. vel Ol. Gujac. vel Ol. Camph. that is, Camphor. solut. in Sp. Nitr. which is an excellent Remedy.

The Rugin and Googes, by thinning the Caries, make the Remedies penetrate deeper, and produce a quicker Effect. Those Remedies, by their caustic Parts drying and calcining, as it were, the Bundles of Fibres, that still hold by the sound Part, mortify it entirely; thus nothing opposes the Separation of the Portion of the Bone, which ought to exfoliate; but these Oils should be used with great Caution, for they may insinuate to the soft Flesh, that rises up below the red, and consume it, in Consequence of which the Wound would not cicatrize. During their Use, Care must be taken to scrape the Bone every three Days, on Account of the Filth formed there by the resinous Part of those Acids. Those liquid Caustics are particularly proper in spongy Caries; but when the Alteration of the Bone is very deep, they are not active enough, and then we are obliged to have Recourse to Butyr. Antimon. and we repeatedly apply it as often as we think proper. All the Preparations of Mercury are also greatly recommended.

But the actual Cautery well managed is the best Remedy; First, because in applying it upon the Bone, though it appears dry, the corrosive Juices that filled up it's Pores are seen to boil and transpire: Now those Juices hinder, as above-mentioned, the Vegetation of the Granulations, that arise below, and destroy and consume them, in Proportion as they push up; Secondly, the Fire facilitates the Exfoliation, by drying and cauterising all the Fibres of the altered Bone, that had any Relation with the sound.

Some Practitioners condemn the Use of the actual Cautery, and pretend that it only serves to drive the corrosive Juices deeper in the same Manner, as when it is applied upon Cloth, where there is Wax, it only spreads it more. I believe, notwithstanding, that it may be usefully employed in Caries greatly moistened with corrosive Juices.

In Bones altered by the Action of the Air, the Exfoliation is sometimes very slow. That is seen, for Instance, after Amputations. In the Bones of the Cranium, that have been considerably stript of their Covering, the Pieces that should fall, remain firm five or six Months, more or less, without separating, and even without growing loose. Then it is necessary to make Use of a small Chisel, and leaden Mallet, called Googe, to remove or separate the Exfoliation; for, by loosening the Piece, we break some Bundles of Fibres, that adhered strongly

strongly to the sound Bone, and we assist the Impulse of the little Granulations that push below.

Sometimes the Middle of the Tibia is only laid bare, nevertheless both Extremities are separated and unsteady. Then, in order to command the whole Bone without opening the Skin the whole Length of the Leg, we are to observe whether the Flesh surrounding the uncovered Part be low enough to allow the Use of the Saw. In that Case we raise it up as high as we can, and hold it firm to be sawed, and extract each End of the Bone separately. If the Saw cannot be made Use of, we apply the Trepan twice or thrice, in order to break it in two, and extract them separately through the Wound.

We likewise use the Trepan in some deep Caries, where the Bone cannot be easily scraped, we make a large Opening, and apply it two or three Times in the same Line, and break down the intervening Bridges. It is also of great Use in the Caries of the Sternum; but we do not separate the Piece, but leave it to fall by the Suppuration. We likewise employ it for the Diseases of the Marrow.

If one End of the altered Portion of the Tibia was laid bare, there would be no Need for the Saw nor Trepan, it might be extracted by that Extremity, like a Sword out of it's Scabbard, after it is properly freed from the Flesh.

In those Cases it is necessary, before and after the Exfoliation, to keep the Leg a long Time in a Box, or in a proper Situation, that it may not bend inwards, which very frequently happens, particularly in young People.

When the Caries is joined with an Exostosis, the Exfoliative or Perforative is made Use of. We bore several Holes in the Bone, that we may more easily remove the separated Pieces with the Chisel and leaden Mallet. It is easy to judge, from what has been said, that most of those Instruments are only used to thin the carious Bone, and make the Medicaments and Instruments penetrate and carry their Action to it's deepest Part.

It might be asked from whence comes it, that in Exfoliations occasioned by the Action of the Air, though free from Erosion, the Pieces of the Bone are scabrous, and indented at their Circumference, and in their internal Part, which adhered to the sound Bone. I have already said, that that proceeds solely from this, that some Bundles of Fibres resisted more than others, and that the Dryness communicates deeper in one Place than in another, thus the separated Piece ought to appear indented.

It may be asked how those, whose Tibia is exfoliated, can support themselves and walk.

To answer that Question, we are to remark, that the Extremities of the Tibia, though at a very great Distance, furnish notwithstanding all the nutritive Juices, which go to the Formation of the Callus, and that they gradually fill up all this great Vacancy, because they are continually propelled by others which come from behind, thus the Callus grows thicker gradually, and is strengthened by fresh Layers; but the Bone is never so large as before, for the Reasons that I have given, and it's Support is very weak, which is the Reason why the Patient would with Difficulty support himself, if the Tibia was not sustained by the Fibula, which is entire.

To finish what concerns Caries, we know, that those of the Joints are very terrible, upon Account of the Cartilages that cover the Heads and Cavities composing them. That is the Reason why the Cure is slow, and most frequently impossible, on Account of the small Effect of the Remedies upon those hard Substances, which are, as it were, difficult to penetrate. We may likewise say with all good Practitioners, that the Exfoliation of Cartilages is much more difficult than that of the Bones. It is presumable, that that chiefly depends upon two Causes, to wit, their Texture, and the Juices which moisten them.

Their Composition sufficiently shows us, that their Fibres are connected and interlaced in one another, which renders their Separation very difficult. Besides, their nutritive Juice is very glutinous, and consequently very proper to resist the Impressions of the Air, which is the chief Cause of other Exfoliations.

The Exfoliation of the Ligaments is nearly the same; this, when it happens, in certain Cases, renders the Joint unsteady, and disables the Patient.

It will not be improper to relate some Observations of different Caries.

OBSERVATION I.

I Have seen a Skull, where, after an Aneurism upon the dura Mater, there was a carious and worm-eaten Place. The Caries seemed to have begun at the internal Table. The Blood having passed through the little Holes of that carious Part, formed several small indolent Tumors externally, the most considerable of which was upon the Caries, from whence it descended to the neighbouring Eye, which it entirely covered, on which Account it was opened. Nothing but coagulated Blood was found in all these Tumors, but it was in other Respects laudable, and like that met with in other Aneurisms. Amongst those

those Clods of Blood were many hard transparent Plates, so disposed, that they formed many Cells, some of them adhered to the internal Table of the Cranium. Those above were placed perpendicularly, and adhered by one Side to the Pericranium, and by the other to the Cranium; those below adhered to the Cranium and dura Mater.

OBSERVATION II.

A Peasant, who for ten Years had been troubled with so cruel an Head-Ach, that it rendered him blind towards the End of the tenth Year, weary of his Pain, came to the Hotel-Dieu to be treated. His Head being carefully examined, was found covered with a great deal of Hair, and the Skin no Ways altered, except that it only felt uneven and scabrous, and towards the left Parietal was a softer Place, where a Pulsation, like that of an Aneurism, was distinguished; on this Account they would not open it. But as the Patient suffered very acute Pains, he insisted on it's being opened. Nothing issued out but coagulated Blood, like that in Aneurisms.

Like Clods discharged every Dressing. He died six Days after. Mr. Dupré, who treated him, had the Curiosity to examine the Head. He found the upper Part of the Cranium carious, and the dura and pia Mater gangrened in many Places, and as it were incorporated together.

The above-mentioned Person was thirty Years of Age, was of a brown Complexion, with black Hair. He had a dry Constitution, a gay Disposition, good and solid Sense. He was tormented for the four last Years of his Life with extreme Pain of the Head, which rendered him blind, deaf, paralytic, and lastly he became mad.

In the Examination after his Death, the Skin of the Head was found, and covered with much Hair. Though the Bones of the Cranium, particularly the Parietal, were pierced in Holes and carious, it is proper to observe, that the Holes were covered with the Pericranium. The Cranium was easily sawn through, by Reason of it's universal Tenderness and Thinness. Notwithstanding all those Disorders, the dura and pia Mater were very sound, except in some Places where they were pierced. Under those Membranes on the left Side was found a hard livid Substance, as large as a Tennis Ball, which sunk in as far as the Ventricle of that Side, without penetrating it. It was supposed to be the Substance of the Brain, hardened, and as it were petrified. From that Tumor were seen rising as many little Eminences as there were Holes in the Cranium. They pierced the dura and pia Mater. They were bound by the

the dura Mater, which was like Rings, and after having passed through the Holes of the Cranium, they spread in Form of Tufts, or Papillæ, which pressed against the upper Part of the Cranium. There was no Hardness, nor foreign Body on the right Side; nevertheless, the same Eminences were seen as on the left. They likewise arose from the very Substance of the Brain; and having pierced the Membranes, proceeded in the same Manner to press against the Bone, and caused the same Disorder there.

OBSERVATION III.

A Sick Person placing himself upon his Knees in Bed, fractured the upper Part of his Femur, the Caries having eroded one entire Side of the Bone. This Caries proceeded from a fistulous Ulcer, that had succeeded an Abscess of the Thigh.

OBSERVATION IV.

A Young Child being attacked with a cold Tumor in the Fore-Arm, the Ulna was extracted entire, except the inferior Epiphysis, and the End of the Olecranon. It was perfectly well cured, and it made Use of the Fore-Arm and disordered Hand with almost the same Freedom as the other. This Exfoliation began by a Caries.

OBSERVATION V.

I Have seen a considerable Portion of the external Part of the Tibia extracted, it exfoliated lengthwise, and in the greatest Part of it's Thickness. It's internal Surface was entirely indented, which show that the Exfoliation did not extend to the Marrow.

OBSERVATION VI. and VII.

A Nother Patient had a Portion of the Middle of the internal Surface of the Tibia, that exfoliated in it's whole Thickness. It's external Part was very black, and the internal very white. In another, a Portion of the Tibia was extracted, Part of which exfoliated in almost it's whole Thickness, and the Rest as far as the Marrow.

These Observations show, that there is no Blackness except in the Places where the Remedies touch, the others being either white, or of a reddish Colour. The Part of the Bone, which is still covered with Flesh, remains white, and the exfoliated Piece is indented, scabrous and full of little red Points, on Account of the Granulations which have forced it off.

That

That Blackness is very superficial, as is seen by scraping the Bone a little.

OBSERVATION VIII.

ON Account of a Fracture in the Joint of the Foot, the Astragalus was almost totally exfoliated; the Patient was cured, and has walked as well with this Leg as with the other, but he lost the Motion of that Joint.

There are some Caries owing to the Fault of the Marrow; the following is an Instance of it.

OBSERVATION IX.

AT the upper Part of the Tibia was a Hole, that reached to the Marrow. The Pains at first were very acute, but they ceased for a Time, that is, whilst the corrosive Juices only acted upon the Texture of the Bone, but as soon as it was pierced, and those Juices began to vellicate and lacerate the Periosteum, the Pains returned.

OBSERVATION X.

IN another considerable Caries at the lower Part of the Tibia, the Body of the Bone was exostosed, eroded and pierced in many Places to the Marrow. This Caries proceeded from an Ulcer after an Abscess.

OBSERVATION XI.

I Have seen a Caries of the Tibia and Fibula occasioned by their bad Reduction and Treatment after a Fracture. This caused a considerable Extravasation of the nutritive Juices, which formed a very irregular Callus.

From thence we see, how necessary it is after the Reduction of the Pieces to collect well the nutritive Juices by the Bandage, and prevent them from extravasating.

The Exfoliations of Children's Bones are generally very thin. I have seen a particular Example thereof. On occasion of a Fall, a very thin Plate of the first Table of the Frontal Bone of a Child was exfoliated.

It is universally known, that the Bones of the Leg are exposed to frequent Contusions, especially the Tibia, because it projects more forwards than the Fibula, and that it's internal Surface is the most subject to Contusions and Caries, because it is only covered with the Teguments and Periosteum, whereas all it's other Parts are provided with a Quantity of Flesh. It is for this Reason, that old Ulcers of the lower Part of the Leg are generally accompanied with a Caries. Besides, as the

Return of the Fluids is very slow in those Parts, we are not to be surpris'd, if the acrid Serum discharged from their Ulcers, lodging long upon the Bones, should injure them.

OBSERVATION XII.

A Soldier, about seventy Years of Age, who lived near fifteen Years at the Hospital of Invalids, was struck with a Stick upon the upper Part of the Frontal Bone, near the Sagittal Suture. This Blow was neither painful, nor accompanied with any bad Accident, but only with a slight Contusion, which was soon dispersed by some Compresses dipt in Brandy. Towards the End of October 1695, he discovered a Tumor at the struck Part. It gave him no Pain, except when he rubed it with his Hat. He applied to one of the Surgeons of that Hospital, who, seeing a hard insensible Tumor, immediately supposed it a Wen, and applied resolvent Plaisters to it, which made a ferous Matter lodged under the Pericranium to ferment, and enlarged the Tumor so much, as to oblige Mr. Morand to open it. He was very much surpris'd to see the Fibres of the Flesh and Teguments greatly hardened there, and the Pericranium, as also both Tables of the Skull, eroded, which left a Hole as large as a Six-pence. The whole carious Portion of the Cranium was laid bare; but three Days after, a Fever supervening, the Suppuration became very bad, and in a small Quantity, the Symptoms continued to the twenty-first, when the Patient died.

On Account of this Observation, I could not dissuade myself from giving a Case related by a celebrated Surgeon of Amsterdam, called Roonhuyzen.

OBSERVATION XIII.

IN 1664, a Person was seized with great Pain in the right Arm, which continued near three Months. After which it passed to the left Arm, and a considerable Quantity of Bile being extravasated at the same Time, caused an universal Jaundice. Some Days after a Tumor formed on the Head, immediately above the Sagittal Suture, near it's Junction with the Lambdoidal. The Tumor was indolent, and as large as an Egg. A Physician ordered some Medicines, and suspecting that it might be owing to a verolic Virus, he salivated the Patient, which diminished the Size of the Tumor, but it soon after increased very much, and became painful. The Pain did not cease till after it was opened, whereby a very acrid Serum was discharged. The Ulcer being nearly cured, the Pain returned, which obliged the Surgeons to re-open the Tumor, but

but the Patient was little relieved, because the corrosive Humor had already rendered the Bone carious. The Patient finding himself in so deplorable a State, called in the most able Physicians and Surgeons of the City. It was concluded, he could not be cured, unless by a second Salivation; but he would not consent to it. He lived near two Years in this melancholy Condition, and as the Pain increased daily, they were obliged to re-open the Tumor once more; but, the Caries having penetrated to the internal Table, they thought the only Means to effect a Cure would be to remove the carious Bone by the Trepan, because the corrosive Sanies, that was discharged, fell upon the dura Mater, which occasioned intolerable Pains. The Patient having consented to the Operation, the carious Bone was removed, and he was greatly relieved, and free from Pain three Weeks; but as soon as the Wound began to close, the Pain returned as violently as before, which obliged the Surgeon to scrape the Bone very deep quite round the Trepan, but without Relief; therefore, they were obliged to uncover a larger Portion of the Bone, to find out the Progress of the Caries. The Day after, they found it extended five or six Lines Breadth further. They applied the Crown of a Trepan capable of taking in the whole carious Bone; but as the sawed Piece could not be raised, because the Hole of the first Trepan was filled up with Flesh, which was united to that Piece, the incisive Pincers were employed to cut and raise the Bone by Pieces; after which the Patient was perfectly well cured.

This Observation shows, that People with a carious Skull are greatly to be pitied. The Patient was first salivated unsuccessfully; nevertheless it was concluded, in a famous Consultation long after, that he could not be cured without undergoing it a second Time, so mere a Prejudice is it, that those Kinds of Caries are always owing to some verolic Virus.

If, on Account of a Sciatica, an Ulcer is seen with a Caries in the Hips, it is charged to the gouty Humour only; if the Caries is in the lower Jaw, it is said to be caused by some decayed Tooth, and if it attacks any Phalanx, it is laid upon a Panaris; if it is in the Tibia, some Contusion of the Perioosteum is accused; but if the Caries is met with in any of the Bones of the Skull, Nose or Palate, we persuade ourselves that it is owing to some verolic Virus, and the Patient is salivated unnecessarily and unsuccessfully. An infinite Number of Examples, nevertheless, prove, that those Sorts of Diseases may be caused by the particular Vice of the Fluids, that moisten or nourish those Parts.

C H A P. V.

Of Exostoses.

THE Exostosis is a Swelling of the Texture of the Bone, or a Tumor that forms upon it's Surface, which is generally accompanied with a very acute Pain, that increases in Proportion to it's Growth.

In order to a clear Conception of what I am going to say upon this Subject, it is necessary to attend to two Things; first that the Blood circulates slower in the Bones than in the soft Parts, on Account of the little Play, and Fineness of the Vessels distributed there; those Circumstances united, necessarily produce a slow Circulation.

It is certain at first Sight, that the Arteries, being closely surrounded, and embraced by hard, stiff, and inflexible Parts, as the bony Fibres are, cannot by their natural Elasticity dilate, and contract, as easily as the Arteries of the soft Parts of the same Calibre; consequently they cannot receive so much Blood at each Systole of the Heart, nor so forcibly propel what they have received. It is necessary to add, that they are neither shook, nor compressed as those of the soft Parts are by the different Motions of the Muscles, which greatly increase, and facilitate the Circulation of the Blood in those Parts.

Secondly, besides the little Play, and slight Compression of the Arteries of the Bones, their Smallness should also contribute to retard the Circulation. Indeed the Blood that flows there, undergoes much more Attrition than in the Arteries of the soft Parts, which, though they should be finer, ballance that Attrition by their Elasticity.

From thence we see, why the ossific Vessels ought to be more subject to Obstructions than the others; but it was necessary, that the Blood flowed more slowly there than in the soft Parts, because as it is not so moved, nor forced, it more easily deposits this glutinous Juice in the Lymphatics, which ought to serve to nourish the Bones, whilst the serous Particles are carried back to the Rest of the Mass. That likewise occasions the Salts to unite together more easily, and apply more immediately by their plain Surfaces, in short, they are better disposed to crystallize. Thus in distilling Sp. Sal. Ammoniac, we perceive that, when the Beak of the Alembic is narrow, and the Fire a little slackened, the volatile Salt collects, and prevents the Spirit from flowing, which is easily remedied by holding a lighted Charcoal against the Beak, which dissolves the Salt.

The second Thing necessary to be attended to is the Structure of the Periosteum, because the Pains accompanying Exostoses are

are chiefly owing to it's Tension; and in order to a full Comprehension of their Violence, it's Structure must be known.

The Periosteum is a Membrane, that closely embraces the whole Body of the Bone, and is provided with an infinite Number of Arteries, Veins, Nerves, and Lymphatic Vessels, which are distributed by many Branches into the solid Part of the Bone, by pervading many little Holes that pierce the Surface, and they make some Progress betwixt it and the Periosteum, from thence proceed the Furrows on the external Part of the Bone, which end by so many little Holes, through which the nutritive Vessels pass. Those Pits are formed by the Pulsation of the Arteries, like those in the internal Table of the Skull.

The Periosteum generally ends, where the Epiphyses begin, which immediately receive all the Vessels serving to nourish the Ligaments, Tendons, or Muscles attached to them, and those Vessels enter through considerable Holes, that pierce them; I have said generally; for if any Part of the Epiphysis should not be employed in the Articulation, it is covered by the Periosteum, as is seen in the Head of the Humerus.

All the large Tendons pierce the Periosteum to be inserted into the Bone, and the Fibres of most of the Muscles, which are believed to be attached immediately to the Bone, are only united to the Periosteum, so that in raising it, their Fibres are raised at the same Time.

All the Pieces of the Skull, and most of the Bones are covered with the Periosteum, which at the Head is called Pericranium by Reason of the Vicinity of the Bones thus named. It is nevertheless the same as in the other Parts.

The Bones of the Carpus, Tarsus, and Ear, are covered with the Periosteum, the Parts of the Bones exposed to continual Friction, as their Extremities are, and which must receive each other, and the Teeth are unprovided with it, and in that the Wisdom of the Author of Nature cannot be sufficiently admired.

If the Situation of the Periosteum, and it's Connection with the neighbouring Parts are attended to, we shall easily perceive, that it must have the acutest Sensation of any Membrane of the whole Body; which is still a Consequence of it's Structure.

In general, all the Membranes of the Body are exquisitely sensible, which is easily discovered by considering their Texture. They are Expansions formed of many Fibres interwoven in different Directions, according to the different Uses they are appointed to. Two Sorts of Fibres are remarked, some are purely membranous, or tendinous, and others nervous. The last are formed by the Extremities of the Nerves, which spread

out, and separate into a Thousand very small fine Filaments.

It is seen from thence, that there is no Part in the Animal where the nervous Fibres are more exposed to the Action of internal, and external Objects, than in the Membranes; for in the other Parts those Fibres are fewer, and covered, and as it were, quilted with Flesh, Glands, or Fat; but in the Membranes, they are quite naked, and present themselves to meet Objects. They likewise receive the whole Force of their Impression. Besides, they contain more nervous Fibres, than any other Part can in the same Space. To which must be added, that they are more or less elastic in Proportion to their Tension, Texture, Equality of their Figure, and the Copiousness of the Spirits, which moisten them. The Union of these different Circumstances renders them capable of a more quick, and powerful Shock. From thence comes it, that the Membranes of thin, and delicate People, are more subject to be briskly moved by the Impression of external Causes, or by that of the Passions; because as they are dryer, and in greater Tension, and their Spirits more moveable, they are consequently more capable of being violently agitated, even by the weakest Impressions.

But amongst all the Membranes, none are of so exquisite a Sensation as the Periosteum, nor whose Pains are so grievous, first, because it is more extended; now it's Tension exposes it to be more briskly shook, whereby upon the least Inflammation attacking it, all the Filaments composing it, and those connecting it to the Body of the Bone, are shook at the same Time, and as it were, half separated from one another, now it is by these various Divulsions, that we ought to judge of the Violence of the Pains. We ought to consider the least Tensions of the Periosteum like those of other Membranes, when inflamed. It is to be remarked, that it's Tension very frequently increases as well by the Size of the Swelling of the Bone, as by the Inflammation seizing upon it then.

Secondly, from the Periosteum being strictly bound round the Bone, it follows, that it more nicely feels the Impressions of external Bodies, than the other Membranes. It is, as it were, placed between the Anvil, and Hammer, that is, it is contused by the very Bone, upon which it is stretched, whereas the other Membranes yield to Blows, and elude their Shocks, because they are, as it were, quilted with Fat and Flesh, &c.

Thirdly, it's close Connexion with the Tendons causes that, when it is inflamed, or in more Tension than common, whether by the Increase of Size of the Bones, or by any other Cause, its Draggings are communicated to the Tendons, and consequently to the Muscles, which are thereby agitated with convulsive,

vu'swe, and irregular Motions, that mutually increase it's painful Shocks.

We must not therefore be surprised, if the Pains of the Periosteum are so violent, and acute, during the Growth, and Increase of the Exostosis, since the Bone cannot swell without the Separation, and Laceration of it's Fibres, or if they always continue to the End of the Cure of those Tumors, or until the Periosteum be lacerated, relaxed, or putrefied.

Although the Nature of Exostoses be very different, we will reduce them under two Species, one of which includes all those owing to Infiltration, and the other those that are the Effect of Extravasation.

The Exostoses by Infiltration are either universal, or partial; universal when the whole Body of the Bone is exostosed, partial, when only a small Portion of it's Body is swelled. Both are simple, or compound.

Those with a Caries, or any other Indisposition, I call compound.

The Exostoses by Extravasation are likewise of two Kinds, universal, or partial, simple, or compound.

Such is the general Division of Exostoses. Let us now give an Account of those Diseases, and begin with Exostoses by Infiltration, and as the partial ones insensibly lead us on to the Knowledge of the universal, we will immediately speak of the Formation of the first.

We have said in speaking of Caries, that the verolic Acid is a volatile, that chiefly acts upon the Lymph, and it's Organs, that it is too subtle to stop at the Mouths of the capillary Arteries, and consequently to circulate with the Blood. The Acid being carried into the Texture of the Bones, is stopped there by the Slowness of the Circulation, and by it's Mixture with Alkalies. The alkaline earthy Parts of their nutritive Juice, blunting it's Points, render it less penetrating and corrosive, and that more or less, according to it's first Nature, and the Variety of Constitutions. It follows from thence, that though this Acid, which is mixed with the Lymph, has produced many Disorders in the soft Parts, nevertheless it causes no other Effect in the Bones, than the Inspissation of their nutritive Juice, which, being forced as in general by the Blood, acts against the Sides of the bony Canals, and if it meets with any, whose Spring is weakened, it forces them to dilate gradually, nevertheless without rupturing them; which occasions the Bone to swell, and enlarge greatly by a very thick, and saline nutritive Juice, that is very proper to harden the Bone by closely uniting their component Fibres. Those Tumors are only then a Swell-

ing of a small Portion of the Body of the Bone, and are very common to verolick People. They are generally called Nodes, because they rise up like a Knot upon the Surface of the Bone, which is naturally smooth.

It is easily seen, why this Acid sooner attacks the Bones of the Head, and the Tibia, than the others; it is because they are more exposed to the Injuries of the Air, and Impressions of external Bodies, and there is Reason to believe that, if certain Parts of those Bones are attacked rather than others, it is because they have been contused, which is always the accidental Cause of the Loss of Spring in those Tubes; from whence it follows, that the thickened nutritive Juice sooner fixes there than elsewhere.

This Tumor does not suppose then any Destruction of the natural State of the bony Fibres. They are full, indeed, of coagulated Humors, which occasion the Swelling, and Hardness; but those Indispositions are not incurable, and Experience teaches us, that by using proper Remedies, we can procure an insensible Resolution of those inspissated Humors, and clear, and re-establish the Vessels in their first Calibre.

But as the Blood does not circulate without Difficulty in streightened, or rather strangulated Vessels by their Engagement in the Tumor of the Bone, it gradually loses of it's Fluidity, and soon after extravasates, and mixes with the nutritive Juices of the Bone, which by this Mixture ferment; the Salts, which were before bound by the gross Sulphurs, extricate themselves, and subtilize, and their Points being at Liberty, pierce and erode the Node. Then the Caries is joined to the Node, and renders it compound.

OBSERVATION I.

A Woman attacked with the Lues Venerea, had a Node of the first Species, as large as an Egg. She was cured by Salivation, and the Size of the Node was diminished so considerably, that only a little Swelling remained. Some Time after she died, and the same Surgeon who had treated her, having opened her, had the Curiosity to separate the Leg, where the Node was, to examine how it was resolved, and the State of the Bone in that Part. He observed it's Disposition to be the same there as elsewhere, except that it was a little more swelled.

Compound Nodes appear upon the Surface of the Tibia, which cannot be resolved by Salivation, and which must be extirpated by the actual Cautey.

The Bones most subject to those Sorts of Exostoses, are the Bones of the Skull, Face, and Leg, and especially the Tibia, the Condyles of the Humerus, and Ulna, because they are all more exposed to the Impressions of the Air, and external Causes.

The

The Tumors called Gummi are common to verollic Subjects, and are frequently so confounded with the Node, that it is proper here to specify very exactly their Differences.

Those Tumors are seated betwixt the Periosteum and Bone. They commonly appear upon the Bones of the Head, and Humerus. They are entirely similar at first to the Ganglions of the Tendons; and as these are formed by an Extravasation of the mucilaginous Liquor of the Glands, with which the Sheaths of the Tendons are lined, in like manner Nodes are formed by the Extravasation of the nutritive Juice of the Periosteum, which is naturally glutinous, like that of the Tendons, of which it is, as it were, only an Expansion.

The Contusion of the Tendons, or Periosteum is the accidental Cause of both these Tumors. They suppurate difficultly like the Ganglions; and that only happens, because the mucilaginous Humors, that form them, do not become acrid, and putrify but with great Difficulty.

Let us proceed to universal Exostoses by Infiltration, that is, those occupying the whole Body of the Bone, and that have been said to be simple, or compound; and let us begin with the first.

The Increase of Size cannot be explained but by supposing two Things; first, that the Texture of the Bone has been relaxed, otherwise the Vessels composing it, could not yield as much as is necessary to give Passage to the Matter, that produces the Swelling, and is forced there at each Circulation. Secondly, that the bony Fibres are choaked up, as it were, with a very thick nutritive Juice, that is charged with saline and earthy Particles. All this conspires to make the Texture of the Bone swell, which by the Hardening of this Glue, becomes likewise more weighty, and compact than in it's natural State, and as this Increase happens without destroying it's Texture, I call those universal Exostoses by Infiltration simple. They from simple become compound, when the saline Particles, with which the nutritive Juice is charged, are freed from their Sulphurs, and they attack the Texture of the Bone. Let us now explain the Swelling, that happens to the Bones of the Scorbutic.

We have said, in speaking of Caries, that the scorbutic Acid was grosser than the verollic, because it commonly follows the Course of the Blood, and does most Mischief in the Parts most moistened with it. Those Diseases are Lividities, Swellings of the Bellies of the Muscles and Gums, Spots, and Pustules of the Skin, Hemorrhages. But in Order to a clear Explanation of those produced by that Acid in the hard Parts, we are to remark,

mark, that if any Acid is mixed with the Blood, it coagulates and precipitates it nearly as Pressure does Milk, so that the Serum being thus separated from it's fibrous Parts is drawn along by the Torrent of the Circulation, whilst the other is fixed in different Places, where it produces the above-mentioned Swellings. This Serum, which is become acrid, continuing it's Course, is at length carried into the Texture of the Bones; there it lodges on Account of the Slowness of the Circulation in those Parts, and produces the same Effect upon the mucilaginous Juice of the Bones, as Vinegar does upon Gum Ammoniac, that is, it softens it's Parts by separating them from one another, and rendering the nutritive Juice too thin, which it does more or less according to it's different Degrees of Acidity.

All those Changes may be compared to those happening to an Egg when steeped in Vinegar, which softens the Shell, and dissolves the White; the Texture of the Bone softens in the same Manner, whilst the Gluten dissolves, and consequently becomes incapable of binding, and closing the bony Fibres. This Texture being thus softened yields gradually, and thereby compresses the sanguinary Vessels, which still retards the Circulation of the Blood more, which no longer obeying as in common the Impulse of the Heart, stagnates, and fixes in different Places, whilst the Serum separates more and more, and insinuates into the Texture of the Bone; thus the Bones of the scorbutic soften, and swell. If the Cartilage, that unites the Epiphyses to the Body of the Bone is not yet ossified, it softens more easily than the rest of the Texture of the Bone; and as it becomes too weak to sustain this Swelling, the Epiphysis sometimes separates from it. Lastly, as the alkaline Salts of this Juice are weakened, or dissipated, the Points of this Acid disengage themselves more and more, attack the Texture of the Bone, separate, and carry off some Parts; whereby it becomes more porous and light.

This Explanation clearly proves how all the Disorders of the hard Parts happen in the scorbutic; it is evident, why they are so liable to a Swelling of the whole Body of the Bone, and not to a Node; why those Bones are more light and porous, and sometimes as it were, wormeaten; and why this Swelling is effected almost without Pain, contrary to that of the verolick Node, because the same Serum, that moistens the Texture of the Bone, likewise moistens the Periosteum, and blunts it's Sensibility; lastly, it is seen, how this Swelling may diminish, and the Bone recover it's primitive Texture and Hardness; especially when the Scurvy has not arrived to it's last Stage.

We

We have said, in speaking of Caries, that the scrofulous Virus keeps the Medium betwixt the verolic and scorbutic, and that it comes nearest to the Nature of this last; we have likewise said, that it unites more particularly to the Synovia of the Joints: Therefore the Alterations it produces are less felt in the Body of the Bone, than at it's Epiphyses, and they are daily seen to moisten and swell, especially those of the Joints of the Hands and Feet, without the Body of the Bone being anywise effected. Sometimes those Swellings are preceded by those of the soft Parts, in other Cases the Epiphysis is greatly swelled, whilst the Teguments retain their common Size. Those Bones frequently recover their common Hardness, in Proportion as this Virus is destroyed.

Thus are formed universal Exostoses by Infiltration, which I call simple, as well in the Scorbutic, as in the Scrofulous.

Let us examine how the simple can become compound.

Whilst the Salts, that choak up the bony Vessels, are entangled by the branching Parts of the Sulphurs, they cause no Disorder; but they gradually exalt to such a Degree, as to lacerate the Vessels, and then the nutritive Juices and Blood being mixed together ferment in the Cancelli of the Bone, and thus make the Exostosis degenerate into a Kind of Abscess, or else those Salts become so caustic, as to erode the Texture of the Bone, and then the Caries is joined to the Exostosis, which may happen many Ways.

For in some Cases the Caries begins by the Alteration of the Juices that moisten the Texture of the Bone, in others by that of the oily Juices of the Marrow; in some the Caries has only eroded a very small Part of the Bone, and in others it's whole Body is rendered so rotten, that it's Texture is destroyed thereby.

There are many Examples of those different Kinds of compound Exostoses, and amongst others I have seen of the Tibia and Fibula, where their whole Body was exostosed by Infiltration, and carious at the same Time. I have seen a Radius, that was entirely exostosed, except at it's upper Part, and so carious, that it's whole Texture was destroyed.

OBSERVATION II.

IT was the Radius of an Invalid. He was about thirty-five Years of Age, and being received into the Hospital, he said, and proved by a Certificate, that he had been wounded by a Musket-Shot, above three Years before, and that the Balls had pierced the Bone quite through; which seemed very probable by the Holes discovered there. But the Surgeon, who

was very skillful, and famous, having examined, and interrogated him strictly, he owned to him after his Reception, that his Disease only proceeded from a considerable Collection of Humors, that had gradually occupied the whole Fore-Arm. Some Incisions were made, and the whole Radius was immediately perceived to be exostosed, which made him resolve upon amputating the Fore-Arm, after which the Bones were well cleaned, in order to the Examination of this Exostosis at Leisure. It began two Inches below the Head of the Radius. It gradually enlarged towards it's inferior Extremity, which had been so eroded, that there remained no Trace of the Part, which is articulated with the Carpus. Three Holes were perceived there, that reached to the Marrow, but the greatest Singularity was, that the corrosive Juices had so eroded the Substance of the Bone, as to have separated a Splinter about six Inches long, which included the whole internal Circumference of the Bone, namely, that which contains the Marrow. This Splinter was sheathed within the Cavity of this Exostosis, like a Sword in it's Scabbard. He was cured at two Months End without an Exfoliation of the Humerus. I have seen a like one of an Humerus.

Let us proceed to Exostoses by Extravasation.

When the offic Tubes are opened, the Flux of their contained Juices forms Tumors like Rocks, which are more or less irregular, according to the Variety of Motion, the Quantity of Matter, and the different Configuration of the neighbouring Parts. The antecedent Cause of those Tumors is an Incision or Contusion of the Bone, and as the extravasated Juices are in a good State, I call them simple Exostoses by Extravasation. Those that dress Horses, and Horses too are very subject thereto. I have seen an Exostosis by Extravasation in the metacarpal Bone of an Horse. The nutritive Juice was perceived to have discharged through some little Apertures in a tarsal Bone. This Juice was laudable, and in a good State, as it had no Ways injured the Bones it covered. Wherefore I call them simple Exostoses by Extravasation.

When the extravasated offic Juice is infected with any bad Virus, the internal Surface of the Bone is found eroded by it's Corrosiveness in the whole Extent of the Exostosis.

In some the Caries begins by the Alteration of the Juices, that moisten the Texture of the Bone; in others by that of the oily Juices of the Marrow. In some the Caries has only eroded a very small Part of the Bone, which is totally exostosed, and in others the whole Body of the Bone is almost carious.

The accidental Causes of those Caries are likewise the Incision, Contusion, and Fracture of the Bones.

OBSERVATION III.

IN February 1692. a young Man, about fourteen Years of Age, came to the Hotel-Dieu, and said, he had fallen about six Months before, and dislocated his Arm. In Consequence of which a considerable Tumor had formed at the upper Part, that increased daily. Some Country Surgeons had unsuccessfully tried to reduce it several Times, which obliged him to come to the Hotel-Dieu, where he was examined by Messrs. Petit and Saviard. Different Names were given this Disorder. Some thought it an Aneurism, others pretended it was a Scirrhus; lastly, after it was judged incurable, they contented themselves with applying some Anodynes to calm the Violence of the Pain. The Patient, finding they could not cure him, quitted the Hospital to return back, but he did not go far; the enormous Weight of the Tumor, joined to his extreme Weakness, made him return the same Day, and he died the following one. Mr. Saviard very carefully examined the Tumor, and opened it where it was felt soft. The whole Body of the Bone was found extraordinarily swelled, and of itself formed the Bulk of the Tumor, whose internal Part was filled with many little Cells of different Sizes and Figures, which formed a very friable and spongy Substance, and that were full of a very putrid Serum.

The Tumor weighed ten Pounds. The Head and Articulation of the Humerus were very sound, as also it's lower Part about six Fingers' Breadth long, and the Elbow Joint was likewise in it's natural State.

The following is an Example like the above-mentioned.

OBSERVATION IV.

MR. Tripier, Surgeon, was called to see a Patient in the Quarter of St. Germain de l'Auxerrois; he found a Tumor, that occupied a great Part of the right Thigh. He ordered proper Topics to ease the Patient, but without any Hopes of Cure. He attended this Disease many Years, and the Patient died at last in Misery. After having raised the Teguments, he observed the femoral and crural Muscles to have entirely lost their Form and Figure, and so blended together, as to be expanded like an Aponeurosis, and make, as it were, a general Covering for the whole Tumor.

The better to examine the Piece, the Os Ilium was separated from the Os Sacrum and opposite Pubis. All the soft Parts being removed, the Tumor was of the prodigious Length of nineteen Inches; it's Middle was two Feet some Lines in Circumference. It began near the posterior Notch of the Os Ilium,

and

and ended at a small Distance from the Knee. Its Figure resembled a Bag-pipe. Its external Part was uneven, furrowed with irregular Bumps, some more, some less, large and prominent. The Head of the Femur in its Articulation with the Acetabulum was natural. Its upper Part was blended in a confused Manner, but it had preserved about two thirds of its natural Figure towards the lower Part, and was more bent inwards. Its Articulation with the Tibia was, as in general.

In order to examine the inner Part of the Tumor, it was cut vertically nearly in the Middle from one End to the other, five or six Pints of a sanious Liquor discharged from it. Its whole internal Part was provided with Cells of different Sizes, that communicated with one another. They were cartilaginous, membranous and bony. The Matter remaining sticking to their Sides in no wise differed from melted Glue. The Lining of the Tumor was six Inches thick in some Places, in others four, and lastly, in others one, or one and an half. After having destroyed all the Cells, Depressions were remarked, that answered to the Bumps already mentioned. The Head of the Femur, which was entire externally, was observed to be quite hollow; and the Part of the Femur they supposed to find fractured at its Separation, was so expanded and unfolded, as to make a Part of the external Surface of the Tumor. As this Disease was one of the most extraordinary, he asked the Relations how long he had been afflicted with it, who assured him he had had it fourteen Years. It was occasioned by a Fall. The Tumor weighed twenty Pounds. Those Exostoses are very singular, and it is very difficult to explain their Formation.

The Exostoses, that attack the spongy Bones, and particularly the Epiphyses, enlarge much more than the others by Reason of their thin and spongy Texture, which allows a more free Flux of the nutritive Juices there than elsewhere. Sometimes they are very painful, the Sanies they discharge, eroding the Ligaments and Tendons, which surround the Joints.

Let us now proceed to the Prognostic.

It is difficult to make a just one of Exostoses, unless the Cause that has produced them, their Progress, and the Place they occupy, be well considered.

The Exostoses, owing to Incisions and Contusions of the Bones, are infinitely less dangerous than those succeeding Ulcers, critical Abscesses, or a Fracture.

All Exostoses from an internal Cause, especially Nodes, which I call simple, that is, those where the Fibres of the exostosed Bone are simply dilated, are cured by a proper Salivation. Whilst the Fluids are in Motion, frequent Frictions are made upon

upon the Node with Sp. Vin. Camph. mixed with a little Ol. Guaiac. vel Ol. Sabin; after which the Part is covered with Emplastr. Sapon. mixed with Emplastr. de Vigo and Mercuri. Towards the End of the Cure, Absorbents taken internally are of great Service. If the Node is with Caries, it must be laid bare to destroy it; but the Means, that ought to be employed, must be different according to it's Depth. For, if it is superficial, the Ruginé is to be used, and afterwards Ol. Guaiac. vel Ol. Camph; if it is deep, Recourse must be had to the actual Cautery, to exfoliate the diseased Bone; but it is always necessary to observe, that all those Remedies would be useless, if we did not endeavour to correct the vitiated Fluids, that is, the venereal Virus by a proper Salivation, or the Scrofulous by the most proper Remedies.

As for the Scorbutic, no Specific is known for it's Cure. We must be contented with purging frequently. Recourse is to be had to the Decoction of the Woods, to Panacea, to Viper Broths, and such like Remedies. Nature very frequently cures such Diseases, provided she be assisted by some chosen Medicines.

OBSERVATION VI.

I Have seen a young Man, the whole Joint of whose Foot was so moistened with a scrofulous Virus, that all the Bones were injured. He had been dressed eighteen Months by a very skilful Surgeon, who, out of Patience with so obstinate a Disorder, quitted him, and contented himself with advising him to anoint it from Time to Time with a Medicament composed of balsamic and penetrating Parts, as Sp. Vin. charged with Ol. Cinnamom. and Ol. Caryoph. Sal. Ammon. and Camph. and to cover it with the Ung. divin. or that called Manus Dei. He visited him some Time after, and found him perfectly cured without any Exfoliation. The Joint, which was greatly swelled, had recovered it's natural Size.

Strumous Girls are commonly cured at the Appearance of their Menfes, and Boys when they arrive at Puberty.

It is proved by the Experiments of many skilful Surgeons, that simple Nodes may be resolved, that is, those formed by a Swelling of a Portion of the Bone; so that, if the Tumor is as large as an Egg, three-fourths may be resolved, and that, tho' the Bone always remains a little prominent, it is notwithstanding very sound. The best Proof of which is, the Person feels no more Pain in that Part. I conceive that happens in the following Manner.

The Juices, which have been fixed, and coagulated by the venereal Acid within the Canals of the bony Fibres, and which have

have dilated them as before-mentioned, being melted down, and intimately mixed with the Mercury, may, in Part, transpire, and the Rest entering into the Vessels may be evacuated by the Salivation. The internal Part of the Fibres being cleared, they shrink, but, because they have been greatly distended, and as some Portion of this thickened Juice always remains amongst the Fibres, the Bone is always more prominent there, and those Fibres must occupy a larger Space.

If the Tumor is gummous, Recourse is had to general and specific Remedies, as in the preceding Case; and if the Matter is still soft, a Puncture is made to the Body of the Bone to squeeze it out by a repeated and sufficient Compression. If the Puncture does not succeed, an Incision is made to the Bone, the Length of the Tumor, and properly suppurated. If the Tumor is soft, and of a moderate Size, Emplastr. de Vigo cum Mercur. vel Emplastr. e Ranis cum Mercur. suffices to resolve it. I have in several Cases seen those Sorts of Tumors so hard, that one would have thought they were formed by the Swelling of the Bone itself; nevertheless, after having ordered the Patients to bathe thirty or forty Days, and use the Decoction of the Woods for their sole Drink, they have been entirely dispersed.

If the Caries is joined to the Exostosis, the Exfoliative or Perforative Trepan is made Use of; several Holes are bored to remove the disjointed Pieces more easily with the Chisel and leaden Mallet; but those Instruments are only used to thin the carious Bone, and make the Fire and Medicaments penetrate better, and operate on the deepest Part of the affected Bone.

As for Exostoses in Form of Rocks, it is necessary to observe that, if their Basis is small, and they can be moved, they may be taken off, either by the Rugine or Chisel, or by the Saw; but, if their Basis is very large, it is necessary for us to apply the exfoliating or common Trepan, to pierce it in different Places, applying the Crowns near each other, that the Bridges and intervening Pieces may be more easily removed by the Gouge or Chisel. If it is necessary, the Cautery is applied to it, which cicatrises the opened Mouths of the Vessels. When the Rock-like Exostosis is of an extraordinary Size, and includes almost the whole Circumference of the Bone, and is deep, it is necessary to proceed to Amputation.

When the whole Body of the Bone is exostosed by a scrofulous Virus, &c. its Cure is very difficult, tho' all the Specifics for such Diseases be employed: Amputation is the most sure Method.

F. I. N. I. S.

